ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LX. No. 5. CHICAGO, SATURDAY, FEBRUARY 3, 1912. ISSUED WEEKLY.

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY
MARQUETTE BUILDING, CHICAGO

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SUBSCRIPTIONS.

One Year, United States.....$3.00
One Year, Canada.....4.00
One Year, Foreign Countries.....6.00
Single Copy, 10 cents. Back numbers, beyond one month, each .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

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ELECTRIC POWER IN MILK-BOTTLING ESTABLISHMENTS.

On other pages of this issue will be found an article dealing with electric appliances in the city dairy. The city dairy of today is principally an establishment for pasteurizing, bottling and distributing milk, and but little is done along the line of the business which we are accustomed to connect with the word "dairy," namely, the making of butter and cheese. In the city dairy, the milk is received from the farm and put in condition for distribution to the consumer. This involves not only the bottling of the milk, but its cleansing and sterilization. After sterilizing, the milk must be kept at a low temperature in order to be delivered to the consumer in the best condition.

The city dairy offers opportunity for the application of electric power not only in the operation of the machinery used in handling the milk and the bottles, but especially in its application to refrigerating machines. On the score of both cleanliness and economy the electric motor offers advantages in this line, and combined with these advantages there should be the attractiveness of a low rate for power offered by the central station. The demand for power for refrigeration reaches its maximum in the summer time, when the machines are usually operated for 24 hours. In the winter time they may either be operated not at all, or perhaps for only a few hours during the middle of the day, when the load on the central station is light. Such a load, of course, is a very desirable one for the central station, and deserves the very best rate which the central station makes for any small consumer—a better rate than would be given to an all-the-year 24-hour consumer. The latter must pay the demand charges for the equipment which supplies his power, whereas the demand cost for a summer-load, or off-peak consumer, is paid by the user of the corresponding power at the time of the peak load.

The application of electric current for sterilizing has made little progress. The heating of the milk is usually accomplished by the use of steam, but as it is very important to limit the temperature to about 165 degrees Fahrenheit, precautions must be taken that the milk is not heated to the same temperature as the steam; in other words, the admission of steam to the apparatus must be very carefully regulated. This is done in some establishments by means of hand control; in others thermostats are used for the purpose. The conditions of heating any such apparatus would seem to make the use of electric current ideal. While

electric heat can be very simply regulated through a thermostat, the installation described in this issue requires the use of compressed air for controlling the steam and the consequent installation of a separate air-compressor in addition to the pasteurizer proper. It would seem that electrical manufacturers might well devote their time to developments in this field.

Another possibility for the use of electric current in pasteurizing is through the medium of ultra-violet radiation. This radiation is easily produced by means of a quartz-tube mercury-vapor lamp, and such radiation is known to have very strong bactericidal properties. It is already being applied to the purification of water in Europe, and will no doubt come into extensive use for this purpose. In the case of milk the conditions are not so favorable because a turbid liquid is somewhat opaque to the radiation, which consequently does not penetrate to so great a depth. By exposing the milk, however, in sufficiently thin sheets to the ultra-violet radiation, it should be possible to make this a practicable method, and we understand that developments are now under way looking to this end.

LOAD-FACTOR.

While the general significance of the term "load-factor" is well understood, its application to detailed instances meets with considerable variations of usage. The definitions which have been adopted by our national societies do not meet with favor in practice. The definition given in the Standardization Rules of the American Institute of Electrical Engineers is as follows: "The load-factor is the ratio of the average power to the maximum power during a certain period of time." It is provided that the maximum should be continued for a definite interval. The definition of the National Electric Light Association is as follows: "The fraction expressed in per cent obtained by dividing the average load for any given period of time by the highest average load for any one minute during the same period of time." The principal deviation from these definitions in practice consists of substituting for the maximum demand the value of the connected load, since the maximum demand is very often unknown. Further than this, however, the period of time for which the average is taken is very often not a continuous period. Thus one person may compute a load-factor by the use of the average consumption for an entire month; a second person may assume that the monthly consumption is confined to 12 hours a day and six days in the week and base the load-factor upon the average during this period of time. A third individual may exclude Sundays and holidays, but base his average upon the use of current for 24 hours a day on working days.

The National Electric Light Association also defines an "operating-time load-factor" as a load-factor considered only during the time of operation. The operating-time load-factor is thus not based on any arbitrary rule, but upon an actual operating time where this has a definite value; thus in a factory which runs for 300 days a year and is only open for 10 hours a day, its yearly consumption would be averaged over 3,000 hours. If it operated only eight hours a day for 300 days, the yearly consumption would be averaged over 2,400 hours. If it operated 10 hours a day for 306 days, the yearly consumption would be averaged over 3,060 hours.

In the tables given in connection with the article upon "Electric Power in the City Dairy," in this issue, the load-factor is computed upon the basis of 24 hours per day every day, and upon the connected load. Many refrigerating plants operate continuously in the summer time, and it is consequently not desirable to use any other basis for computing load-factor in this case. In such an industry there is no definite operating time, and consequently the use of an operating-time load-factor is also excluded. In future articles it is our intention to give whenever possible both the load-factor and the operating-time load-factor upon the bases indicated above, and uniformity in this practice will, it is hoped, prevent any misunderstanding upon the part of our readers.

In referring to former articles in which load-factors were given, readers should bear in mind that values were not given in every case upon the same basis. Reference to the kilowatt-hour consumption, and to the connected load, will, however, enable a proper comparison to be made.

CONCERNING THE NATIONAL CODE.

The remarks relative to the National Electrical Code made by V. H. Tousley, retiring president of the Western Association of Electrical Inspectors, in his address at the recent annual convention of that society, were very timely and appropriate. Mr. Tousley deplored the disposition on the part of some departments of electrical inspection to formulate rules of their own without due regard for the National Code, and emphasized the lack of uniformity of inspection requirements and the resultant confusion and dissatisfaction necessarily arising from such a procedure. It was interesting to note in this connection that electrical contractors have felt keenly the awkwardness of the situation referred to, and have complained of this annoying state of affairs. It is often the case that the territory in which a large electrical contracting concern does work includes a number of rather widely separated towns and cities; and in cases of this kind it appears there is sometimes encountered a sufficient lack of uniformity of inspection rules to result in embarrassing contentions between the inspector, the contractor and the patron of the service, which may even result in the contractor's losing money on the job.

A still more unfortunate circumstance relative to the modification of Code requirements to suit what are considered to be local needs, is that it nearly al-

ways results in a lowering of electrical construction standards. Exceptions occur, of course, in a few of the larger cities where wiring practice is sufficiently advanced to justify local inspectors in prohibiting certain types of construction which the Code is still obligated to permit. But these exceptions, as yet, are rare. There are few documents in which every aspect of the subject treated is more carefully or more ably considered than in the so-called National Electrical Code. And it may be added that the literal adoption of its specifications by local inspection boards is a procedure which, in most instances, cannot be improved upon.

MINERAL PRODUCTS OF THE UNITED STATES.

The United States Geological Survey has recently issued its final report upon the output of mineral products in the United States for 1910. Prominent among the figures given is the enormous output of copper, of which over 1,000,000,000 pounds were produced in this country. This is slightly less than the record output of 1909, but is, nevertheless, greater than the production of any other country, as the United States produces over one-half of the entire production of the world. The value of the copper output for 1910 in this country was over $137,000,000. The average price of copper in 1910 was 12.7 cents per pound. Figures from a private source give 13.1 cents for 1910 and 12.75 cents for 1911.

The platinum output in this country is very small, amounting to only 773 troy ounces for the year. This is an increase over the two previous years, but was only about one-half the output of the years 1901 and 1906, in each of which over 1,400 ounces were produced. The value of the platinum was $25,277. There seems no hope for an increased platinum production in this country, and unless new fields of platinum ore are discovered it is quite probable that platinum will continue to grow more scarce, and that the price will steadily rise, since the demand increases every year. The price of platinum nearly doubled in two years, the average value in 1910 being $32.70 per ounce or $1.15 per gram. The present market price is $47 per ounce.

The output of tungsten showed a marked increase over the two preceding years and reached a record value. One thousand, eight hundred and twenty-one short tons of tungsten ore were mined, but the report does not show the amount of metal secured from this ore. The value of the ore was over $807,000.

The output of mica was nearly 2,500,000 pounds in the sheet form, and this represents a large increase. In addition 4,000 tons of scrap were produced. The total value of this mica is $337,000.

Crystalline graphite showed a falling off from the previous year, the output being 5,590,592 pounds, with a value of $295,733. The production of amorphous graphite, on the other hand, increased to 35,945 tons, with a value of $81,443.

DENIAL OF VOLUNTARY REDUCTION IN RATES.

An interesting condition has come to pass in the State of Wisconsin, where the State Railroad Commission has refused permission to the Kenosha Gas & Electric Company to reduce its charges for commercial electric lighting to a point which the Commission believes to be less than the actual cost of furnishing power. The Commission came to the conclusion that the reduction was only contemplated for the purpose of injuring the business of a competing company, and that the ultimate result would be an injury to the public interest. The reasons are given in more detail upon another page of this issue.

The attitude of the Commission seems the only consistent one in relation to the general policy of the Wisconsin Commission and to the principles upon which rate regulation is founded. For the protection of investors, no company should be permitted to serve the public for less than the cost of its service, as the Commission has pointed out in this case. The ultimate results of such a procedure might injuriously affect not only the investors in the securities of the company, but the consumers as well. The conditions in Kenosha are somewhat anomalous, since there are already in existence two competing companies, a condition not consistent with the monopoly theory upon which rate regulation is based. It seems very probable, as the decision of the Commission indicates, that a rate war between the two concerns must result disastrously to at least one of them, and probably to both.

A somewhat similar consideration has arisen in Baltimore, where the local contractors have petitioned the Public Service Commission of Maryland to restrain the central station from handling electrical material and doing electrical installation work at prices which it is impossible to meet in honest competition. It is claimed by the contractors that if the central station once gets control of the entire business, prices will soar to a point which will reimburse the company for losses which it is now incurring. On the other hand, an official of the central station claims that a profit is being made out of the sale of fixtures and the wiring business, and that the business is being carried on solely for the convenience of customers who are not ready to pay cash.

While the facts and merits of the case will probably not be fully known until the hearing has been held by the Commission, the principles involved in the case would seem to be similar to those in the Kenosha controversy in Wisconsin. It has been claimed that the Commission would have no authority to interfere with the business of the central station, providing its charter permitted it to undertake such business, but if it is true that the company is carrying on such business at a loss, it would seem that the investors are not being properly protected unless the Commission is able to step in and prevent such a deficit in the accounts of the company.

Lake Trip for Michigan Electric Association Convention.

The Michigan Electric Association will hold its annual convention the latter part of June. Following the very successful experiene of last year the Association will hold all of its meetings on board ship and it is expected to make a start from Port Huron about June 21 on the Steamship *Majestic* of the Northern Navigation Company. Sailing north, the first stop will be Pentang on Georgian Bay. From there the convention will proceed in a small boat, the *Waubic*, especially built for this trip and make a day ride through the 30,000 Islands. This will be exceedingly interesting, as at no time exceeding fifteen minutes will the party be in open water. It is expected that the boat will arrive at Parry Sound about 8:00 p. m. Saturday, June 22, and a dance will be arranged at the hotel. From there the trip will be continued to Killarney in the North Channel, and from this point the trip to the Soo will be made in daylight on Sunday. It will be decided later how much time will be spent at the Soo or Mackinac, and the return will be made by direct route through Lake Huron, arriving at Port Huron at about 1:00 p. m. Tuesday, June 25.

The Michigan Electrical Association has become affiliated with the National Electric Light Association, and is now designated as the Michigan Section.

The Electric Vehicle Discussed by Milwaukee Section, N. E. L. A.

The Milwaukee Section of the National Electric Light Association, at its meeting in the Public Service Building, Milwaukee, January 25, was addressed by Godfrey H. Atkin, manager of the Chicago office of the Electric Storage Battery Company. In a paper entitled "The Electric Vehicle as a Source of Revenue to the Central Stations" Mr. Atkin pointed out the growing use of electric pleasure vehicles and commercial trucks, and said that the central stations had not shown the interest that this off-peak load warranted. He emphasized especially the results that had been obtained through the use of the Iron-Clad Exide battery in truck work.

This paper was followed by an interesting discussion of the subject by E. W. Goedjen, of the Commonwealth Edison Company, Chicago, who outlined the very satisfactory business the latter company was securing through the charging of electric vehicles.

It was announced that the Milwaukee Electric Railway & Light Company, would push this branch of the business very actively and with that end in view has opened a public garage for electric vehicles exclusively.

Convention of Minnesota Electrical Association.

The convention of the Minnesota Electrical Association will be held in Minneapolis, Minn., March 20, 21 and 22. The program will include papers on the following subjects: "Oil and Other Internal-Combustion Engines," "Sale of Electrical Appliances by Central Stations," "Competitive Illuminants," "Accounting," "Mazda vs. Gas, Gasoline and Arc Street Lighting," and "Steel, Concrete and Rural Pole-Line Construction."

The meeting will be held during the big electrical show at Minneapolis, and it is expected that a very large attendance will be present.

Flaming Arc Lamps in St. Paul.

The regular January meeting of the Saint Paul Gas Light Company Section of the National Electric Light Association was held in the office of the company on Monday evening, January 22.

The subject for the evening was "Our New Flaming Arc Lamps." M. N. Webster gave a very interesting talk, comparing the new flaming lamp with the old inclosed carbon type and showing the decided superiority of the former, especially from a mechanical standpoint. Two of these lamps were shown in operation in order to bring out more forcibly their good points.

In connection with the above it should be mentioned that the St. Paul Gas Light Company has just completed the installation of 300 General Electric inclosed-type, flaming arc lamps for use on the principal streets of the city. Two hundred more of these are to be installed by the end of the year. These lamps are made for either alternating or direct current and may be burned either in series or in multiple. In St. Paul there are approximately 100 direct-current multiple lamps and about 200 alternating-current series lamps.

The direct-current multiple lamp operates on a 110-volt circuit, taking 6.5 to 7.0 amperes and requiring 70 volts at the arc. The series-type lamp operates on a ten-ampere series circuit and requires 58 to 60 volts per lamp. Series circuits have an average of 45 to 50 lamps each.

Postponement of New England Section Convention.

The annual meeting and convention of the New England Section of the National Electric Light Association will be held at the Hotel Kimball, Springfield, Mass., March 21 and 22. The date previously announced conflicts with the Automobile Show which is to be held in Boston. As commercial electric vehicles will play a prominent part in this show and as many of the members will wish to attend, it was thought desirable to postpone the meeting to the new date.

Meeting of Wisconsin State Telephone Association.

The regular annual meeting of the Wisconsin State Telephone Association will be held February 14 and 15 at Madison, Wis. The headquarters of the Association and the exhibit will be at the new Park Hotel, and the convention meetings will be held in the Supervisor's room of the court house.

A tentative program has been arranged as follows: "The Construction of Rural Lines," paper by E. J. Kneen, Bangor, Wis.; "The Workman's Compensation Act," and "The Women's Fifty-Five Hour Law," paper by C. H. Crownhart, chairman of the Industrial Commission of Wisconsin; "Service Area or Rate Making," paper by Alonzo Burt, first vice-president and director, Wisconsin Telephone Company; "The Uniform Classification of Accounts for Telephone Utilities and Its Application to the Smaller Companies," paper by Mr. Gruehl, statistician for the Wisconsin Railroad Commission. There will also be informal discussion upon "The Different Methods of Handling Collections," and "The Handling, Training and Rate of Paying Operators."

The Storage-Battery Car.

At the meeting of the Electric Vehicle Association of America in New York City on January 23 a paper was presented by H. E. Pratt, of the Gould Storage Battery Company, entitled "The Storage-Battery Car." Mr. Pratt's paper had largely to do with the experiments conducted with the Third Avenue line in New York, which have proven that with modern car and battery construction, the storage battery is not only economical but the best agency for lines with light traffic.

T. F. Mullaney, chief engineer of the Third Avenue Railroad Company, further discussed the matter and showed his enthusiasm for the results obtained.

Illinois Society of Engineers and Surveyors.

The annual meeting of the Illinois Society of Engineers and Surveyors for 1912 was hed at the University of Illinois, Urbana, on January 17, 18 and 19. The program was of unusual excellence. The more important engineering topics discussed were stream pollution, sewage disposal, accuracy in surveying, road and pavement problems, and the bridge work of the Illinois Highway Commission. Two illustrated lectures of great interest were given, one by I. O. Baker on the "Panama Canal," and one by H. L. Cooper, on "The Keokuk Water-Power Plant." An afternoon was spent in inspecting the buildings and discussing the work of the College of Engineering.

Marshall L. Barnes.

Within recent years no national organization of electrical men has shown greater enterprise and more commendable spirit of harmony and the desire to co-operate with the other branches of the electrical industry, than the National Electrical Contractors' Association of the United States. Within the past eighteen months the membership of this organization has grown from 525 to upwards of 1,000 members, and this membership covers, with the exception of two, every state in the Union.

The National Electrical Contractors' Association has always been fortunate in its leaders, and its uninterrupted development is a splendid tribute to the work that its presiding officers have done for the raising of the standard of electrical construction, the elimination of the fire hazard in electrical work, and the desire upon the part of electrical contractors to select and use only materials of the highest grade.

Within recent years, so changed have become the relations of the manufacturers, the supply men and the contractors, that where bitter antagonism and disregard of the qualifications and rights of others prevailed, a fine spirit of cordiality, forbearance and leaning toward fraternity has come about. So far as the contractors are concerned it was fortunate indeed that contemporaneous with the development of this new spirit, their presiding officer and leader was a man who, by nature, endowment and training, is so eminently fitted to act as their sponsor and guide in co-operating with the other elements in the industry.

Marshall L. Barnes,
President of the National Electrical Contractors' Association.

Marshall L. Barnes is one of those men who fundamentally believe in the brotherhood of man. He makes no idle claims for equality of wealth or privilege, but he is incessantly demanding that honest work receive its proper recompense. Always good natured, apparently never in a hurry, he is working every minute and is one of the busiest men one could find; and the peculiarity of it is, that he reserves but a fraction of his time for promoting his own interests and is busy a large part of what should be his leisure time in helping along every good cause he may happen to be connected with.

The firm of Barnes & Payton, Troy, N. Y., has been in existence about eighteen years and has done some of the largest work in that and other sections of New York State, in Vermont, and Western Massachusetts. This establishes the connection of Mr. Barnes as an active element of electrical contracting. He was one of the organizers of the Eastern New York Electrical Contractors' Association, an organizer of the New York State Electrical Contractors' Association and an organizer of the National Association. Each year since the organization of the National he has been named as a director representing New York State. He is serving his third term as president of the Eastern New York Association, was twice president of the New York State Association, and is serving his second term as president of the National Electrical Contractors' Association. He is past president of the Commercial Travelers' Association and is a director of the Chamber of Commerce of Troy, N. Y., and for several years was at the head of the Commission on Municipal Affairs. He takes an active interest in local politics, and has held some office for the last six years. He is president of the Round Lake Improvement Company, a director in the Troy & Buffalo Land Company, and several other organizations, a Mason, a member of the Rensselaer Republican Club, a Maccabee, and is affiliated with some twenty other organizations, holding a position on the directorate or the executive committee of about a dozen of these. He is manager of the Postal-Telegraph Cable Company at Troy, and finds time with all this to contribute quite regularly to the *National Electrical Contractor*, the official organ of the Association, and to engineering and technical journals. He has a fine city house in Troy, and an all-year cottage at Round Lake, close by Saratoga Springs, N. Y., where, with Mrs. Barnes, his charming wife, it is his delight to entertain his friends.

An Invitation from Montana to the N. E. L. A. Convention.

Those attending the June convention of the National Electric Light Association at Seattle, Wash., will be royally entertained by the people of the great Northwest. Among the organizations extending a welcome to the visitors is the Northern Idaho and Montana Power Company, Kalispell, Mont., who sends this message to those attending the convention: "On your return from the N. E. L. A. convention, in June, we would be pleased to have you stop over and explore our beautiful country, 'the Switzerland of America.' Trout fishing in every stream, and the most delightful climate in the world; therefore, we extend to you a hearty invitation, and you will find the N. E. L. A. glad hand to receive you."

This invitation is extended through the courtesy of W. B. MacDonald, general manager, and A. P. Tills, new business manager of the company.

Jovian Rejuvenation at Peoria, Ill.

In connection with the Peoria Electrical Show, Illinois Jovians under the direction of Statesman Henry N. Remington initiated a class of twenty-three at Observatory Hall, Peoria, Ill., on the evening of Friday, January 26. The initiation was preceded by a dinner at 6:15 p. m., brief addresses being made by Perry Boole, Electric Appliance Company; E. W. Kearns, Monarch Electric & Wire Company; George Loring, Shelby Electric Company; C. E. Stapp, C. E. Stapp Electrical Company; and H. M. Butler, Mills Electric Company, Peoria, Ill. The floor work was in charge of a capable team, and both the dinner and initiation passed off very satisfactorily, a record for early closing of the exercises being established.

Meetings of Philadelphia Company Section.

The Philadelphia Electric Company Section of the National Electric Light Association has held a number of meetings during January.

On January 5 the Meter Department Branch meeting was largely attended, and Frederick Strattner presented a paper on "Wireless Telegraphy," explaining in a clear and highly entertaining manner the governing principles of this branch of electrical science. Each step of the practical demonstration was illustrated by detailed drawings. Messages were sent to and received from local points. Messages from Cape Cod were intercepted, and communication was had with a steamer at Marcus Hook on the Delaware River.

The Accounting Department Branch meeting was devoted to a general discussion of departmental problems—just such a meeting as means much to a department—full of help to all aiming at a higher efficiency of service.

"Opportunity Night," as observed by the Commercial Department Branch on January 22, was an interesting occasion. The first speaker, John E. Dougherty, of the Soliciting Department, talked on "What the Present Time Means to Us," and pointed out the larger responsibilities that devolve on the individual employee in view of the development of the many and varied uses of our product, and the ever increasing demand. The present time means individual preparedness to use opportunities as presented, and their use brings more opportunities.

A. C. F. Keleher, of the Holophane Company, talked most entertainingly on "Opportunities of Practical Illuminating Engineering," urging his hearers to advance to the higher concepton of the science by utilizing the opportunities available to all, through the various practical educational channels.

The General Section meeting was held on January 15, and Edgar Fahs Smith, provost of the University of Pennsylvania, showed "How the Chemist May Use Electrical Current." Dr. Smith has achieved fame both as an educator and in chemical research work, and performed many interesting experiments, and surprised those of his audience who were familiar only with the old methods of chemical analysis, by demonstrating how the work of qualitative and quanitative analysis formerly requiring hours or days to accomplish, may by electrical methods be accomplished in a few minutes. He also gave practical demonstrations, of the use of electrical current in the manufacture of the nitrates, and in the manufacture of carbide, as well as of the metal calcium showing quantities of calcium that had been produced in the laboratory of the University. Dr. Smith urges the practical electrical men to enter into closer study of the possibilities of the use of electric current in chemical work, and points out the vast possibilities of the field as yet almost untouched in this country.

Eastern Men Invited to Visit Superior and Duluth.

The Lake Superior Electric Club at its last meeting adopted a resolution extending to the electrical men in the East, while on the way to the convention of the National Electric Light Association at Seattle next June, an invitation to visit Duluth, Minn., and Superior, Wis.

The meeting of the club was held in the rooms of the Commercial Club, Superior, with Vice-President W. H. Winslow in the chair. A paper was read by J. B. Crane, of the Great Northern Company, Duluth, entitled, "Voltage Control on Electric Distributing Systems."

Indiana Business Men's Association to Give Industrial Exposition.

An industrial exposition under the direction of the Indiana Business Men's Association will be given in Tomlinson Hall, Indianapolis, the week of February 12. Fred Frohmuth, of Muncie, is president of the Association, and A. Bogue, of Indianapolis, is secretary.

Among the many interesting exhibits being arranged for will be the latest electrical appliances. The second annual convention of the Indiana Business Men's Association will be held during the week of the exposition, and it is hoped that it will be the occason of the largest gathering of retail merchants ever brought together in the state.

Illinois Independent Telephone Association Elects Officers.

The seventh annual convention of the Illinois Independent Telephone Association was held in Peoria, Ill., January 24 and 25. Over 159 members were in attendance and the convention was opened by Mayor Woodruff, who welcomed the delegates to the city. The response was made by L. A. Herrick of Freeport. The following officers were elected: president, L. A. Herrick; secretary, C. H. Hood, treasurer, A. F. Loehm.

Missouri Telephone Merger.

It is stated that the American Telephone & Telegraph Company has purchased eighty per cent of the stock of the Bell Telephone Company of Missouri with the intention of ultimately purchasing the Kinloch Telephone Company, or perfecting a merger, so that there will be but one telephone system in St. Louis and its environs.

Prevention of Industrial Accidents.

At a joint meeting held in Chicago on January 22 by the Chicago Section of the American Institute of Electrical Engineers and the Electrical Section of the Western Society of Engineers, Robert J. Young made an address on "The Prevention of Industrial Accidents." Mr. Young's talk was copiously illustrated with lantern-slide views of the many safety appliances used by the Illinois Steel Company at its various works, one of which alone employs nearly 12,000 men, of whom some eighty per cent are foreigners with very imperfect knowledge of English. Among these safety devices are numerous warning signs in various languages; viaducts, guard railings, safety runways; complete casings for gears, shaft couplings, emery wheels, grind stones, band saws; goggles, face masks, etc.

All switchboards of 440 volts or over are completely guarded to prevent contact with any live conductors. Danger signs are placed on all electrical machinery. Electric crossing bells are extensively used where viaducts or subways are impracticable. All drawings are checked for safety requirements.

Much educational work has been done to make the men aware of possible dangers connected with their employment. A book of safety rules is issued to every employee and he must stand an examination to show his knowledge thereof. An elaborate safety organization has been created with a central safety committee, formen's safety committees, workmen's safety committees and special safety inspectors. Prizes are given for the best safety work. As a result of this compaign for the safety of employees the number of accidents among them has been reduced to one-third what it was before active measures were taken to grapple with the problem.

At the conclusion of some general discussion of accidents and their prevention, a demonstration was made of the Commonwealth Edison Company's pulmotor, an apparatus to restore respiration by means of oxygen in cases of asphyxiation or apparent death from gas or electric shock. This particular apparatus has been used on several occasions recently with completely successful results on persons that had been overcome by gas and for whom all hope had been given up.

Toledo Rate Settled.

The Toledo Railways & Light Company, at a directors' meeting, voted to accept the seven-cent rate provided by the City for electric lighting. Litigation pending in the local courts will be abandoned.

Electric Power in the City Dairy.

Handling and Sterilization of Milk—Bottle Washing—Refrigeration by Electric Power—Data of Typical Installations.

United States census statistics state that the average consumption of milk in cities is 104.5 quarts per capita yearly, or about 0.6 pint each day. This is not the total milk production of the country, but only so much as is shipped into the large centers of population.

Since the advent of more stringent laws safeguarding the food supply, boards of health have been very particular about the treatment and care of milk. Some of the cities have adopted a regulation which requires all milk to be at a temperature not above 60 degrees Fahrenheit when received at the railroad stations. As this regulation is extended and adopted by other cities, it will probably lead to the introduction of artificial refrigeration at the shipping points all over the country as well as at the city centers of distribution. The advantages which have accrued wherever these strict regulations have been put into force give promise of their universal adoption.

The prohibition put upon chemical preservatives, the enforcement of pure-food laws and the strict attention given to milk inspection has made milkmen much more particular than formerly. As a result almost every dairy in the larger cities now uses a pasteurizer. The rapid cooling necessary, directly following pasteurization, creates a fertile field for the labor of the refrigerating-machine salesman and the central-station solicitor.

The city dairy of today is primarily a milk-bottling establishment, where the milk is received from the farm, pasteurized, cooled, stored and delivered to the consumer. Churning is carried on only to a slight extent, and mainly for obtaining buttermilk or for using up surplus supply in hot weather. Where butter is made in small quantities, it is merely a by-product. The making of cheese is seldom or never attempted. Where there is a surplus of skim milk, it is returned to the farm for feeding hogs and chickens, or otherwise disposed of. The making of butter and cheese is carried on at the country dairy or creamery, and installations of this character will be considered in a separate, future article.

Inasmuch as heat is necessary for sterilizing the milk, a steam engine is usually the first thought of the proprietor. In addition to the heat needed for pasteurization, frequently a great amount of hot water is used for cleaning milk bottles, cans and apparatus. Naturally, then, many dairymen are skeptical about motor drive for refrigerating machines.

In hot weather, during three or four months, it is necessary, no matter how cold the milk may be when starting

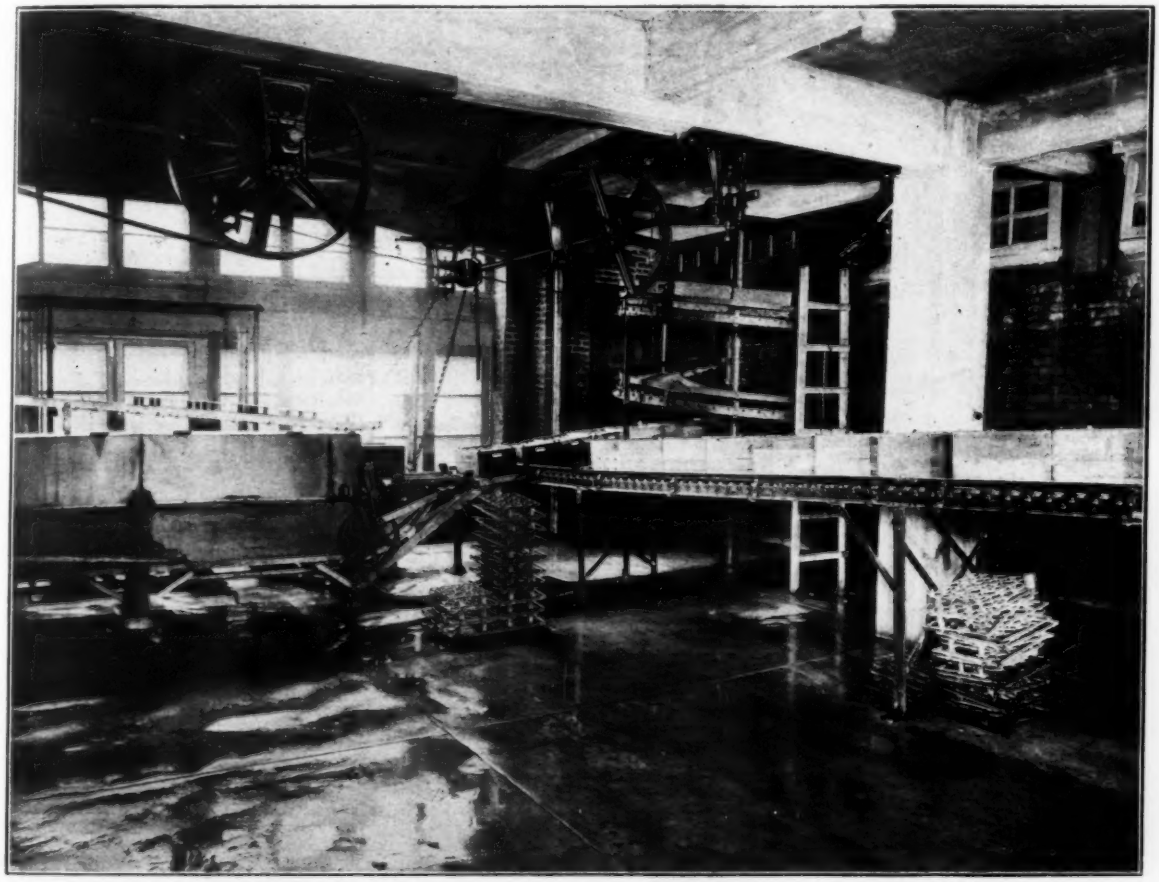


Fig. 1.—Modern Bottle Washer and Conveyor.

out, to carry ice on the delivery wagons to prevent the milk heating to a dangerous point before the customer receives it.

Inasmuch as this ice-making feature of a refrigerating plant would be useful at longest only one-third of the time, the best argument against its introduction is idle investment. Suppose one ton of ice were needed per day for this purpose. Two tons of capacity would have to be provided in the machine and ice tank, representing additional investment and space which would be out of service eight months of the year. The fixed charges for this investment, plus the cost of power to make the ice, together with the necessary labor, will generally be found to amount to more than the ice can be purchased for.

The making of ice and the production of refrigeration directly, are distinct propositions.

Calculations based on ice-making are figured on 24-hour operation. The necessary capacity in the machine is about double the tonnage to be frozen. There are losses at both ends; in the production of the ice, and in the recovery of the stored work of refrigeration, by melting the ice or converting it back again into water. These losses are avoided when using direct refrigeration.

Thus we see that, although artificial refrigeration is an economy, it does not necessarily follow that ice-making would also be.

The arguments to be used in favor of the electric motor drive are flexibility, readiness and cleanliness. The latter is an especially strong point because one of the reasons this modern equipment is being installed is to guard against dirt and disease. The hours of work in this business are, at best, long, and start early. The motor is constantly ready at any hour, and the expense stops when the current is shut off. Steam for an engine must be looked to in advance. The low pressure required for the heating obviates the necessity for a licensed engineer and a higher heat efficiency is possible.

If any preference is given for off-peak business, it is especially applicable here because very little or no power need be used in the cold months, or during the evening hours.

When the best use is made of the water ordinarily obtainable, fifty per cent of the cooling in the hot weather and all of it in the winter time, can be done before calling the refrigerating machine into requisition.

The pasteurizing process consists in heating the milk to a temperature that will destroy disease germs. This is about 160 degrees Fahrenheit. It is then rapidy cooled to a temperature that will arrest fermentation; 35 to 40 degrees is the desired point. This cooling is acomplished by passing the milk over a cold surface, usually the outside of block tin pipes through which cold water or brine passes. The pipes are arranged in a vertical series and the milk cascades over them by gravity after being pumped from the heater to a perforated trough above them. (See Fig. 5.) The milk is then collected in cans or bottles and set in the refrigerator until needed. The cooler is frequently divided into two sections, the upper half of the pipes carrying ordinary cold water; the lower half, refrigerated brine. By this practice most of the heat is removed by the cold water. Especially is this true where artesian well water is available. In middle latitudes well water has a temperature the year around of about 55 degrees. In summer time, the mu-

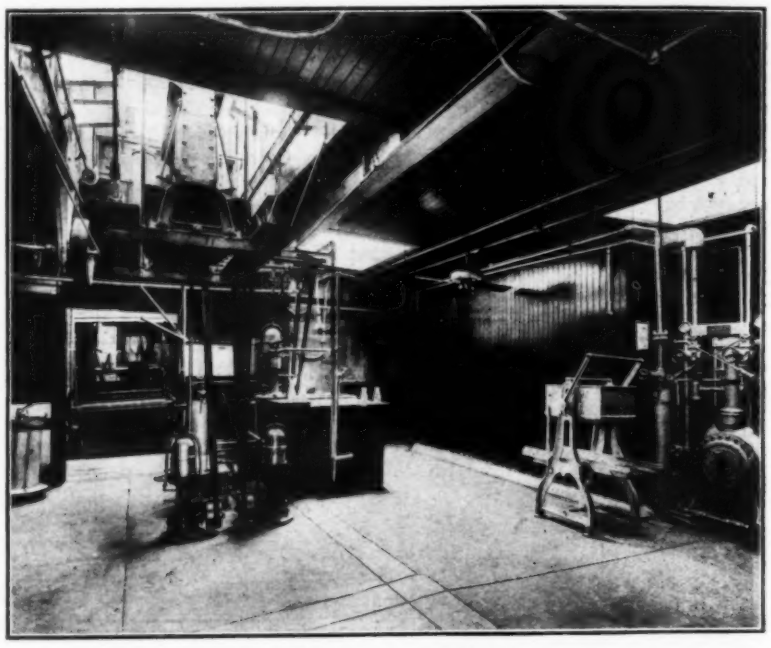


Fig. 2.—Gross Dairy.

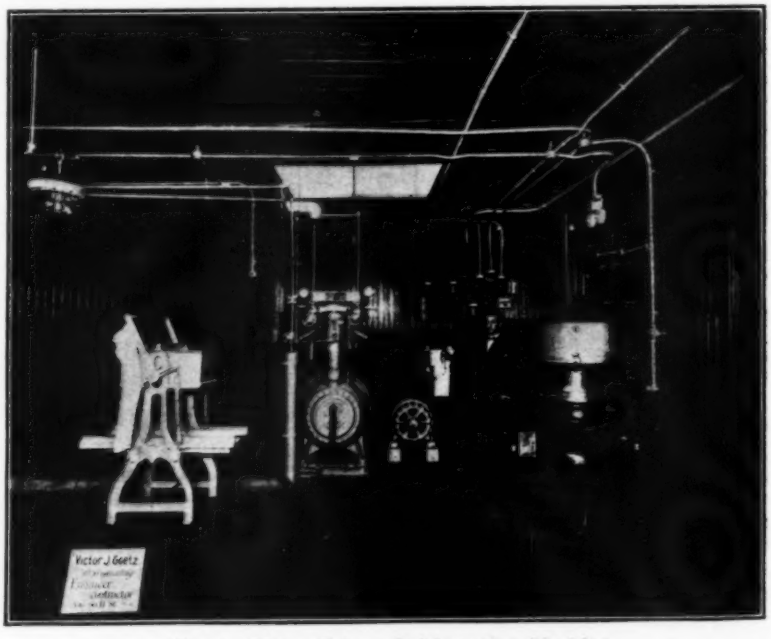


Fig 3.—Motor-Driven Refrigerating Machine.

nicipal water supply reaches 79 degrees. In the winter, it falls to 35 degrees. Thus, in the winter months, this water can be turned into both sections of the cooler and no refrigerated brine need be used. The refrigerating machine can therefore be shut down entirely in the coldest weather. This is another argument in favor of the electric motor.

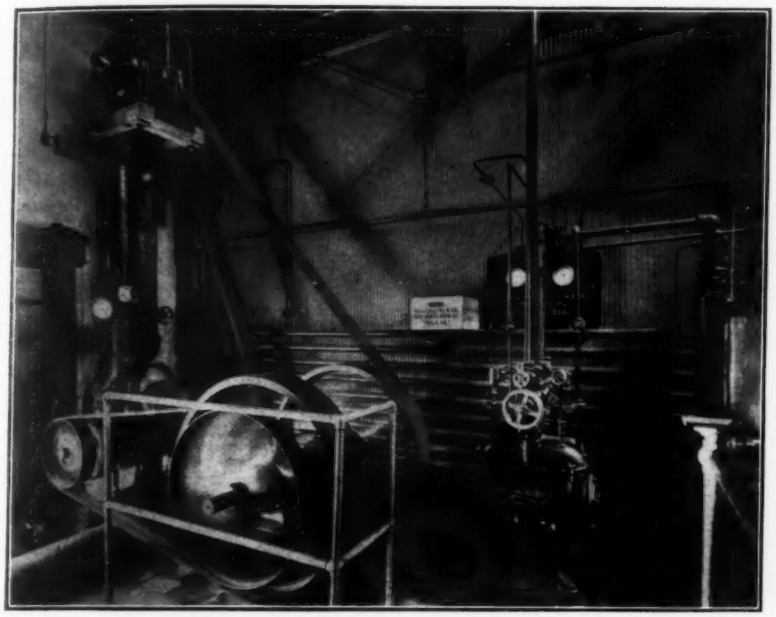


Fig. 4.—Refrigerating Machine, Motor and Brine Pump.

The motor requirements of the milk-bottling establishment are simple, as all apparatus may be run at constant speed. Most of the motors must start under load, unless there is provision of a clutch to be thrown in after attaining speed. On account of the wet conditions and frequent washing of floors, etc., it is desirable to have the motors mounted overhead or otherwise protected from the moisture.

Fig. 5.—Pasteurizer, Cooler, etc. in the Kelly Dairy.

The lighting requirements in a dairy are not unique. Neither intense nor localized lighting is required. Electric lighting with incandescent lamps is desirable on account of the absence of heat or products of combustion.

The motor requirements may be summarized as follows:

	Horsepower.
Churn	1 to 2
Buttermilk Machine	2
Pasteurizer	2
Conveyor	2 to 5
Well Pump	1 to 7.5
Cream Separator and Clarifier	0.25 to 1
Bottle Washer	5 to 10
Bottle Brush	0.12 to 1
Can Washer	3 to 5
Refrigerating Machine, per ton of capacity	2

Fig. 1 shows the latest development in conveying machinery used in connection with bottle washing. The bottles are washed by the dozen in boxes and then conveyed from the wash room to the refrigerator box, where they are filled with the milk coming from the pasteurizer and cooler. The bottles descend by gravity on the runway at the right. After passing through the washer, they are carried by the spiral conveyer to the room above.

A typical installation is the dairy of Mr. Gross in Philadelphia, Pa. Mr. Gross handles about 2,300 quarts of milk daily and pasteurizes every drop of it. He installed a four-ton Brunswick refrigerating machine to do the necessary cooling work. A 7.5 horsepower two-phase squirrel-cage motor drives the machine through a silent chain. The machine runs at a speed of 150 revolutions per minute and the motor at 900 revolutions. This makes a very satisfactory installation, since the machine always starts up under light load. (See Fig. 3.) There are two refrigerator boxes, one 5 by 15 by 9 feet, containing 11 coils of direct-expansion piping and an auxiliary brine tank three feet wide and the length of the box, suspended above, which acts as cold storage. The other box is 5 by 10 by 9 feet, similarly equipped with both direct-expansion coils and a brine tank. A temperature of 38 degrees is maintained. Above the larger box and outside of it is the tank for the brine to be circulated through the cooler, shown in the upper center of Fig. 2, under the skylight. The piping and the pumps are also shown in the foreground.

Mr. Gross formerly bought ice at $2.50 per ton, but he finds the machine a great improvement, both in results and cost.

In addition to the 7.5-horsepower motor mentioned, there is a two-horsepower 220-volt single-phase motor operating the pasteurizer and brine pumps. It is supported on the shelf which shows in Fig. 2, on the left side above the door, and drives by belt through a jack shaft, so as to get the proper speed on the main line shaft. So situated, it is up out of the slop

and water incident to this business, where a thorough washing of the floor and milk apparatus is necessary daily. This motor was in service before the refrigerating machine was installed, and bills approximated $45 per year at ten cents per kilowatt-hour.

The total cost per year is now $543, being an average rate of 4.75 cents, under a load-factor of 15.8 per cent. It is notable, however, that the load-factor for the four months beginning in June runs above 32 per cent. The total consumption is shown on the data sheet.

Separating the refrigeration, and basing the estimate on the previous records, we have, eliminating January and February, a load-factor of 18.2 per cent for ten months. This is a normal figure for dairy refrigeration. The average cost for electric power to pasteurize and cool the milk is one cent for 15 quarts. The power consumption averages 13.6 watt-hours per quart.

Two other motors are used in this dairy for a cream separator and a bottle brush. Both are fractional horsepower, 110-volt, and connected on the lighting meter. One of them is shown to the right in Fig. 3.

Fig. 2 shows the larger refrigerator box alongside of the refrigerating machine. The door is at the far end. A high grade of insulation is used in the walls and proves a great advantage.

An upright boiler located in the farthest corner from the refrigerator, supplies the necessary steam and hot water. A steam pipe is also extended from it into Mr. Gross's residence, immediately contiguous, and takes care of the house heating in the winter time.

The owner expresses much satisfaction with his equipment. He is progressive and will soon add a buttermilk machine which also requires

The term load-factor is used in this article in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected.

power and is to be equipped with a one-horsepower two-phase motor.

Another dairy handles 4,000 quarts of milk daily. This milk is received from the country in 40-quart cans holding about 100 pounds each. It arrives in the city about noon and is hauled to the dairy as soon thereafter as possible, when it is immediately pasteurized and stored in the refrigerator to be kept cool and ready for early morning delivery the next day.

An eight-ton refrigerating machine is used here (see Fig. 4), operated by a 15-horsepower two-phase 60-cycle motor. The latter is suspended from the rafters overhead, so as to be well up out of the wet. The machine is belt-driven through a countershaft and the brine is circulated through three series of piping supplying the brine tank and two refrigerator rooms.

The refrigerator is 26 by 14 by 8 feet, divided into two rooms. The smaller is 6 by 14 feet and contains 50 per cent more lineal feet of piping in proportion to its area than does the larger room. This is because a lower temperature is desired in the smaller or cream room.

Above these rooms, but built as an integral part of the refrigerator, is the brine tank containing 2,000 gallons of calcium brine. This brine is necessary to store up the work of the refrigerating machine, and make it available in larger quantities when wanted.

After passing through the pasteurizer the milk is cooled rapidly to about 40 degrees. The capacity of the pasteurizer is 60 cans of milk per hour. About two hours is required to pasteurize the day's supply. Assume that 50 cans of milk, or 5,000 pounds, must be cooled through 70 degrees in one hour. What refrigerating capacity is necessary? The specific heat of milk is 0.9. This means the capacity to absorb heat is 0.9 that of water. $0.9 \times 5{,}000 \times 70 = 315{,}000$. Hence 315,000 British thermal units will be required. One ton of refrigeration is equivalent to the latent heat in a ton of ice at 32 degrees Fahrenheit, and ratings are always calculated on the basis of a 24-hour day. In one hour, therefore, one ton of capacity can remove no more than 11,887 British thermal units from the milk, and to remove 315,000 units would require a machine of 27 tons capacity, if it were done by the direct-expansion method. This would mean a very large machine which would be in operation but a short period, a condition conducing to high cost in operating expense.

This disadvantage is overcome by the use of the brine storage tank. Here the direct expansion does its work over a longer period, the eight-ton machine operating four or five or more hours, storing the work by reducing the temperature of the brine solution to about 15 degrees Fahrenheit. The brine is then pumped through the cooler and the heat taken out of the milk at a much faster rate than the ammonia has taken it out of the brine.

This dairy makes use of the low temperature at which city water is supplied in winter and operates the refrigerating machine very little or not at all during this period. A very wide range in current consumption results, as shown on the data sheet. No other motors are used in this dairy.

The establishment of R. Uhlrich, Forest Park, Ill., is carried on in a

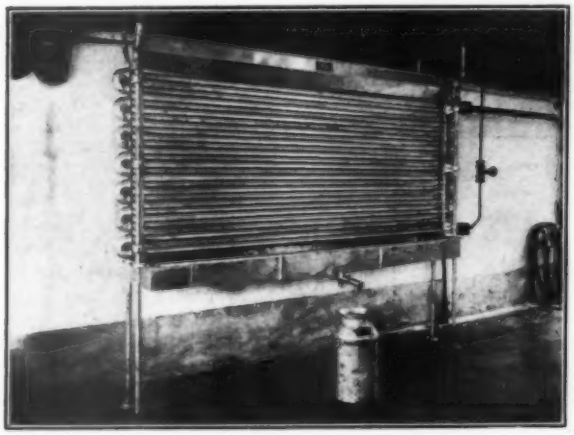


Fig. 6.—Direct-Expansion Cooler.

Fig. 7.—Interior of Refrigerator.

basement and is somewhat crowded. A three-horsepower, single-phase induction motor drives a line shaft to which all of the apparatus is connected, except a bottle washer. This bottle brush is operated by a one-sixth-horsepower motor and washes but one bottle at a time. Connected to the line shaft are three pumps for circulating brine and milk, a separator and a churn. The milk is passed through a filter and a pasteurizer heated by steam, and then flows over cooling coils through part of which cold water, through the rest of which brine is circulated. The brine is formed by mixing ice and salt with the water and fresh ice is added as necessity demands. There is not room at present for the installation of refrigerating machinery, but as soon as a new plant can be put up the proprietor expects to install an electrically driven refrigerating machine.

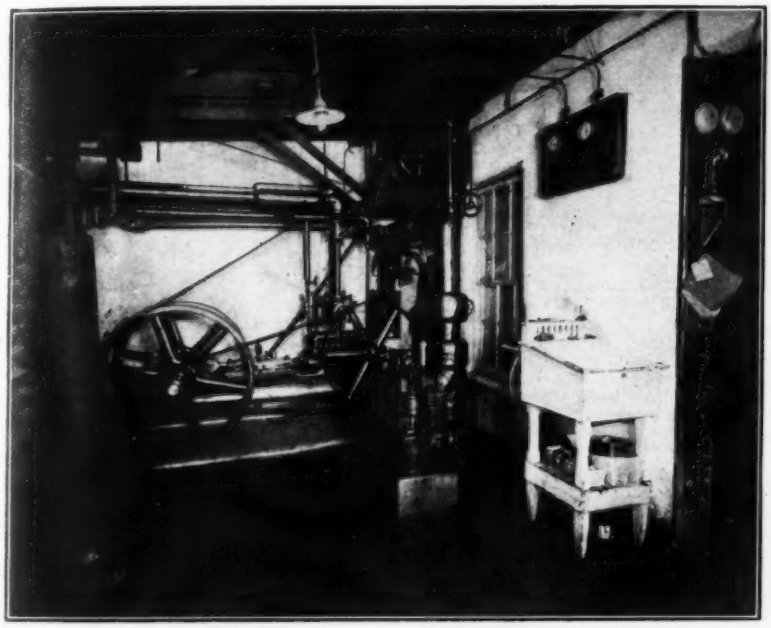


Fig. 8.—Refrigerating Machine, Motor and Brine Pump in Kelly Dairy.

The United Sanitary Dairy, Austin, Ill., has a plant which is able to handle about 3,000 pounds of milk per hour. The milk is received in a large tank and after being brought to a temperature of 75 or 80 degrees is passed through the clarifier, a machine similar to a separator. From here it is passed through the pasteurizer, which is heated by steam and is kept at a temperature of 150 degrees by means of a thermostatic regulator. From the pasteurizer the milk is pumped over the cooling coils through which cold water is circulated in winter and brine in summer. The pumps, two separators and a 200-gallon Victor churn are all operated by one 7.5-horsepower, three-phase induction motor. The separators and clarifier are operated at a speed of 6,000 revolutions per minute. The bottle-filling and capping machine in this plant is operated by hand. For bottle washing there is a machine which takes an entire case of bottles, douses them with hot washing water, then rinses them and then passes steam into them to sterilize them. The machine has a capacity of 48 bottles per minute. It is operated by a 15-horsepower, three-phase motor. A ten-ton Barber ammonia refrigerating machine is operated by a 20-horsepower, three-phase induction motor. This motor drives through belts the compressor and the pump for circulating the brine. In the summer the refrigerating machine is run night and day, the brine being used both to cool the pasteurized milk and to cool a cold-storage room where the milk is afterwards kept. No ice is made in this plant and in summer ice must be purchased to the extent of about three tons per day for icing the milk in the delivery wagons. During severe weather in the winter time it is not necessary to run the refrigerating machine at all. Water from an artesian well is exposed to the cold in a tank on the roof and is then used for cooling the milk in place of brine. A five-horsepower motor pumps the water from the artesian well at a temperature of about 52 degrees. A small bottle brush for cleaning the cream bottles and for bottles less than one quart in size is operated by a 0.5-horsepower, single-phase motor.

Some milk dealers in the large cities maintain their own farms and pay scrupulous attention to the care of the cows and the collection of the milk. Of this class is the Kelly dairy.

There is handled here about 9,000 quarts of milk per day, all of which is pasteurized after reaching the city supply depot. The system of pasteurization and cooling in use is known as the regenerative system. By this method the greatest possible use is made of the heat and cold available, resulting in an economy unknown a few years ago.

Fig. 5 shows the pasteurizer with the top removed, and one-half of the cooler. The pasteurizer is the round reservoir on the right, steam-jacketed, and having within the inside cylinder two blades revolving around a vertical shaft, which keep the milk in circulation so that it will all come in contact with the hot surface of the cylinder wall. From this it is pumped into the trough at the top of the cooler, as shown, and then falls by gravity over the outside of the cooling pipes, to be collected in the lower trough.

To start with, the milk is pumped from the receiving reservoir through the block-tin pipe to the lower side of the upper section of the cooler. It travels the length of the cooler and returns in the tube above it, and so back and forth until it reaches the top pipe, from which it flows to the pasteurizer. As the hot milk just from the pasteurizer descends over these pipes, the new milk is heated to such an extent that very little additonal heat is necessary and it enters the bottom of the pasteurizer nearly as hot as the milk which has just left it. The middle section of the cooler circulates ordinary city water. The lower third circulates artesian well water. By the time the milk has cascaded over these progressively cooled sections, it is at about the same temperature as the well water, namely, 56 degrees.

The other section of the cooler is on the other side of the wall in another room, away from all proximity to the steam boiler, and near the refrigerator box. This section is shown in Fig. 6. It is entirely incased in copper and glass to prevent any possible contamination from air currents, and also to help economize on the cooling work. (Casing not shown.) The pipes of this cooler are direct-expansion ammonia coils, with the coldest at the bottom, and the cooling of the milk is completed, with a resultant temperature of 32 degrees. As before, the milk is delivered, through the wall, into the upper trough, and allowed to trickle down over the cold pipes. After collecting at the bottom, it is drawn off into cans or bottles as may be required. When cans are to be

Data Sheet for City Dairy.

Charles Gross, Philadelphia, Pa. 2,300 quarts daily.

Total connected horsepower, 10; total number of motors installed, 4; average kilowatt-hours per month, 953.

Kilowatt-hours per month for 1911 (motor load only): January, 44; February, 41; March, 78; April, 425; May, 1,195; June, 1,612; July, 2,416; August, 2,096; September, 1,638; October, 845; November, 872; December, 175.

MOTOR INSTALLATION

One 7.5-horsepower, two-phase, induction motor, driving refrigerating machine by chain; one 2-horsepower, single-phase, 220-volt motor driving pumps for brine and milk through counter-shaft; two small 110-volt motors on lighting circuit, whose consumption is not included in above figures.

Load-factor for twelve months: 15.8 per cent.

Load-factor for four summer months, 32.1 per cent.

Load-factor on refrigerating motor alone for ten months, 18.2 per cent.

Average consumption, 13.6 watt-hours per quart of milk pasteurized and cooled.

Leo Bolzereit, Philadelphia, Pa. 4,000 quarts daily.

Motor used on refrigerating machine alone, capacity 8 tons.

Motor is two-phase, 60-cycle, 15-horsepower, 200-volt, squirrel-cage type, running at 1,120 revolutions per minute. Brine pump operated from counter-shaft. Under normal operation, input to motor is 17.9 kilowatts.

Kilowatt-hour consumption for three years is as follows:

	January	February	March	April	May	June	July	August	September	October	November	December
First year	313	30	14	1784	2077	2983	2990	2808	3004	2878	1729	691
Second year	0	0	3	957	1427	1828	2619	2128	2472	2077	1467	936
Third year	14	6	378	874	2092	2879	3000	2694	2963	2594	1948	770

Average kilowatt-hours per month, 1,595.

Load-factor for three years, 21.6, 16.1 and 20.6 per cent.

Load-factor for five-year period, 18.3 per cent.

Load-factor for six summer months, 34, 25.5 and 33 per cent.

Watt-hours per quart for three years, 14.5, 10.9 and 13.8.

United Sanitary Dairy Company, Austin, Ill. Combination drive.

Total connected horsepower, 48; total number of motors, 5; average kilowatt-hours per month, 5,753; average kilowatt-hours per month, per connected horsepower, 120.

Kilowatt-hours consumption for 1911: January, 2,710; February, 3,650; March, 3,510; April, 4,890; May, 7,060; June, 7,330; July, 7,810; August, 8,060; September, 7,340; October, 5,780; November, 4,780; December, 4,920.

Load-factor for twelve months, 12.5 per cent.

Load-factor for five summer months, 16.3 per cent.

MOTOR INSTALLATION

Three-phase, 220-volt, induction motors are used, except for the smallest motor, which is single-phase.

Horsepower	Application
20	Belted to refrigerating machine and brine pump.
15	Belted to bottle-washing machine.
7.5	Drives churn, separator, clarifier and several small circulating pumps through line shaft.
5	Direct-connected to well pump.
0.5	Operates bottle brush.

William Kelly, Philadelphia, Pa. 9,000 quarts daily.

Total connected horsepower, 25.5; total number of motors, 4; average kilowatt-hours, per month, 2,923.

Kilowatt-hours consumption for twenty-four months: January, 1,424; February, 1,731; March, 2,557; April, 3,027; May, 3,455; June, 4,564; July, 4,714; August, 5,068; September, 4,190; October, 2,802; November, 1,825; December, 1,288; January, 916; February, 868; March, 1,329; April, 2,121; May, 3,770; June, 4505; July 4,749;; August, 4,661; September, 4,002; October, 3,340; November, 2,278; December, 1,972.

Load-factor for first year, 22.7 per cent; for second year, 21.4 per cent.

Load-factor for six months in summer, 31 per cent for each year.

Watt-hours per quart of milk, 11.1 for first year; 10.5 for second year.

MOTOR INSTALLATION

15-horsepower, two-phase, squirrel-cage motor, for driving refrigerating machine and auxiliary pumps; 7.5-horse-power motor driving churn, air compressor and three circulating pumps through line shaft; two-horsepower motor driving well pump; one-horsepower motor driving bottle washer.

Name withheld. Connected horsepower, 15.

An eight-ton Barber refrigerating machine is run at 106 revolutions per minute. The brine pump is driven from the fly wheel of the machine at 42 revolutions per minute. It has three cylinders, 3 by 4 inches, single-acting. An actual test under running conditions showed power input to motor to be 18 kilowatts. A 220-volt, two-phase, 15-horsepower motor, running at 720 revolutions per minute, is used.

Kilowatt-hour consumption for one year is as follows: January, 628; February, 450; March, 594; April, 1,521; May, 2,512; June 3,108; July, 4,196; August, 3,593; September, 2,784; October, 1,951; November, 1,171; December, 360.

Average kilowatt-hours per month, 1,906.

Load-factor for twelve months, 25 per cent.

Load-factor for five summer months, 42 per cent.

filled, an extension pipe is connected which carries the milk at once into the refrigerator, and the cans remain in the cold atmosphere.

Fig. 7 shows the interior of the refrigerator box at this dairy. It is 25 by 10 feet and 12 feet high, inside dimensions. The walls are one foot thick and consist of tiled brick, air space, cork and cement. All the cooling pipes and the brine tank are overhead. The bunker is in two halves, one side carrying the brine tank, the other the direct-expansion lines. These are arranged in two rows, six pipes high, the full length of the box. The tank is five feet wide and three feet deep. Seven feet at one end of the box is partitioned off for a cream room and the temperature here is maintained somewhat lower.

A Barber horizontal eight-ton refrigerating machine is used. (See Fig. 8.) It is belt-driven by a 15-horsepower two-phase motor of the squirrel-cage type. A small pulley on the flywheel shaft carries a belt which drives a 4-by-4 duplex Deane brine pump. Originally brine was used in the cooler, but since the new Campbell cooler and regenerative system was introduced, the pump is used only to circulate the brine in the tanks for more rapid cooling.

Other machines used here are a churn, well pump, three milk pumps and a brush bottle-washer. The latter is a double washer carrying six brushes, belt-driven by a one-horsepower motor. Two men are kept busy, one on either side, each handling 750 bottles per hour. Both the inside and outside of four bottles are cleaned at one time as fast as the men can handle them from the hot-water tank.

The well pump is driven by a two-horsepower motor, geared directly to the main shaft. This water is used in the cooler and for condenser of the refrigerating machine. One other 7.5-horsepower motor drives the line shaft shown in Fig. 5. It is located upon a shelf well out of the dampness which is unavoidable on the floor. From this line shaft are driven three small rotary pumps for milk, an air compressor and a churn. The latter does not show in the figure. The air compressor appears on the left and is used to actuate the steam valve supplying steam to the pasteurizer.

Controlled by a thermostat, the temperature is maintained at any predetermined point by opening or closing the valve automatically, with the compressed air as the actuating force.

The average cost of electric power for all purposes is one cent for 22 quarts of milk. The improvement shown in the second year (see data sheet) is ascribed to the use of the new regenerative system and cooler, which was installed in the fall of the former year. The same quantity of milk has been used in the calculations. This is not strictly correct on account of the growth of the business. The figures do not therefore indicate the total improvement in economy. It should be somewhat greater.

Several methods for arranging the piping in refrigerators are made use of, the best being decided by the use and conditions of the installation. For dairies such as the Kelly, the plans shown in Figs. 11 and 13 are used. Direct expansion and brine storage are combined, part of the ammonia coils being immersed in the brine. The ammonia is circulated first through the exposed coils and then through the submerged sections. The brine is cooled down to a low temperature and acts as would cakes of ice, to hold the temperature over night or over Sunday. Fig. 11 would be used only where there is not sufficient overhead room.

Plans shown in Figs. 9, 10 and 12 are adapted to either direct expansion or brine circulation. Fig. 14 is intended for brine circulation only, where the operation cannot be continuous and a larger capacity than piping alone is desirable as a storage feature. We are indebted for the illustrations of different arrangements of piping to the Creamery Package Manufacturing Company, Chicago, Ill.

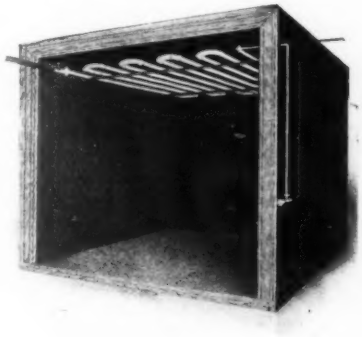


Fig. 9.

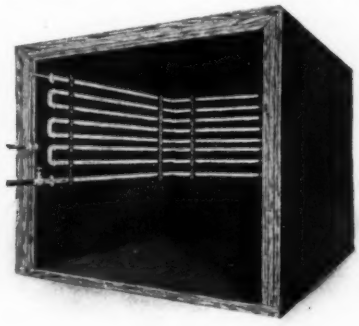


Fig. 10.

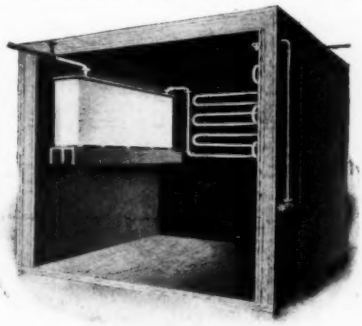


Fig. 11.

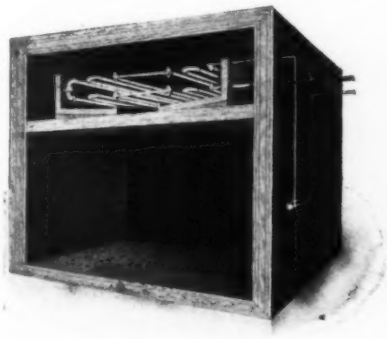


Fig. 12.

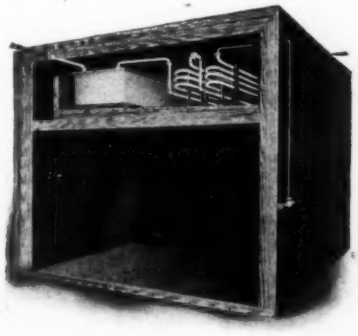


Fig. 13.

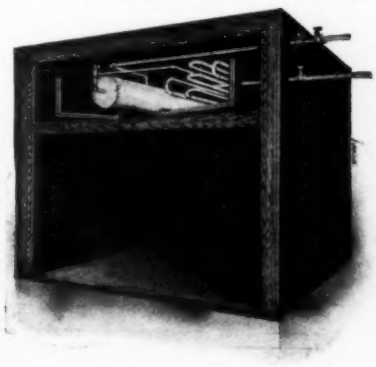


Fig. 14.

Commercial Practice
Management, Rates, New Business

WAYS AND MEANS OF BUILDING UP A PROFITABLE BUSINESS IN A SMALL TOWN WHERE THE INVESTMENT IS LARGE.

By H. E. Morton.

This paper, by the manager of the Oregon Power Company, Albany, Ore., presented at the convention of H. M. Byllesley & Company and affiliated companies in Chicago, January 2-5, shows that even where a large investment is made in a small property satisfactory returns can be obtained if modern methods are adopted. Large stations, also, can benefit by applying the methods described.

In writing this paper, the author has in mind an electric property serving power and light in a town of 3,000 inhabitants.

It often happens that small towns have a very promising future for rapid and substantial growth. The public-service companies find that they must increase their capacity in order to take care of this future growth; otherwise, their plant will become over-loaded, the disastrous consequences of which we all know.

The future is anticipated, a large and modern plant is built, fully equipped with modern apparatus. The distribution system is rebuilt and, when the work is all completed, there is a large investment in a small town, with the electric business fairly well developed.

Then sometimes the town suffers a depression for various reasons, or does not grow as rapidly as was expected, and the company is left facing the problem of earning interest on this large investment, with business conditions unfavorable.

Of necessity, economy must be practiced and operating expenses reduced to a minimum, but not to the extent of lessening the quality of the service rendered.

The management must be surrounded by competent and loyal employees, ready and willing to assist in making the company's business a success. The importance of this cannot be overestimated, for in small towns every employee should be on the alert to make friends for the company and act as a solicitor among his friends, as well as exercising care in his work, doing it well and at the lowest possible cost.

With such an organization, a great deal can be accomplished in the reduction of operating expenses and in the increasing of the revenue.

Present residence consumers can be induced to use more current by the installing of heating appliances and small motors. Our experience leads us to believe that the best results can be accomplished by the solicitor taking these appliances direct to the consumer's home, connecting and demonstrating them, and if necessary, placing the appliances on thirty days' trial. If a good demonstrator is at hand, a demonstration at the office on last discount day creates interest and materially assists the solicitor in his work.

It is, however, time, energy and money wasted to place these appliances, unless they may be used with convenience. To illustrate: The writer was present at a home one evening where the family have an iron, toaster stove, coffee percolator and chafing dish. The good wife wanted to prepare a lunch, using the chafing dish for rarebit, the toaster stove for toast and the coffee percolator. The house was wired with one drop in each room, hence it was impossible to use these appliances on the dining room table.

The toaster was attached to a bed room socket and toast made in the dark, the coffee was made in another bed room and the rarebit made in the kitchen on the range, as the wires were too small to operate all the appliances at once. Large amounts of money have been expended in selling these appliances and it is the writer's judgment that sales should be followed up with a campaign to have proper wiring installed, so that the appliances can be used. Contractors and architects should be educated on this subject, so that all new houses will be wired so that these appliances can be used with convenience.

There are many ways of increasing the revenue derived from stores, and these methods should not be neglected by the solicitor, merely because the store is already using light, for it will be found that by calling, the solicitor can interest the consumer in window lighting, sign lighting, coffee mills, refrigeration, and fans in summer, and in winter (to keep the windows clear), or in some other way of using current.

By persistence, even in a small town, a large amount of window and sign lighting may be secured on a flat rate, by including the cost of the installation in the contract so that a small amount is paid each month, covering the duration of the contract. The contract should not be for less than one year. By securing this business on a flat-rate contract, there is no danger of losing the revenue, as might be the case if the consumer were served on a meter, so that if business happened to be poor the merchant could cut off the lights.

It is important to secure all the possible business from present consumers, as it requires little, if any, additional investment on the part of the company.

Non-consumers on our lines should be connected as rapidly as possible. Different plans of campaign for this business should be carried on from time to time until all have been secured.

One plan was suggested whereby people who desire the service, but cannot pay cash for wiring, fixtures, etc., could give to the contractor a monthly payment contract and, if the contractor is unable to carry the account, assign same to the company at a ten per cent discount, the company to pass on the consumer's credit and collect the bill.

All local workshops and factories where power of any kind is used should be visited and a close study of conditions made, after which the writer believes almost all desirable power business can be secured—if necessary, by selling the motors on payments or renting them if the power business to be secured is desirable and it is impossible to get the business in any other way.

A thorough canvass of residences not on the company's lines should be made and where profitable business can be secured, the lines should be extended to secure this business. A special inducement in the way of a free electric iron can be offered to all who may be reached on these new lines, in order to secure all the possible business when the line is being constructed; it being understood that the order for service

and meter be taken before the construction work on the line has been commenced.

Oftentimes there are small villages nearby, where there is sufficient revenue to warrant an extension of the company's lines, for instance: The Oregon Power Company made an extension from Newport to Priest River, a distance of seven miles. We required no poles for this extension, as we followed our high-tension line which runs from Newport to Sandpoint. This line has a potential of 11,500 volts. We secured on this extension a contract for 102 horsepower in motors from a planing mill, 50 lighting consumers and street lighting. The mill agrees not to use current on our peak load without our permission. Our entire investment in this line, including transformer services and meters, is $10,850, and our yearly revenue, based on the present consumers, will be $3,000.

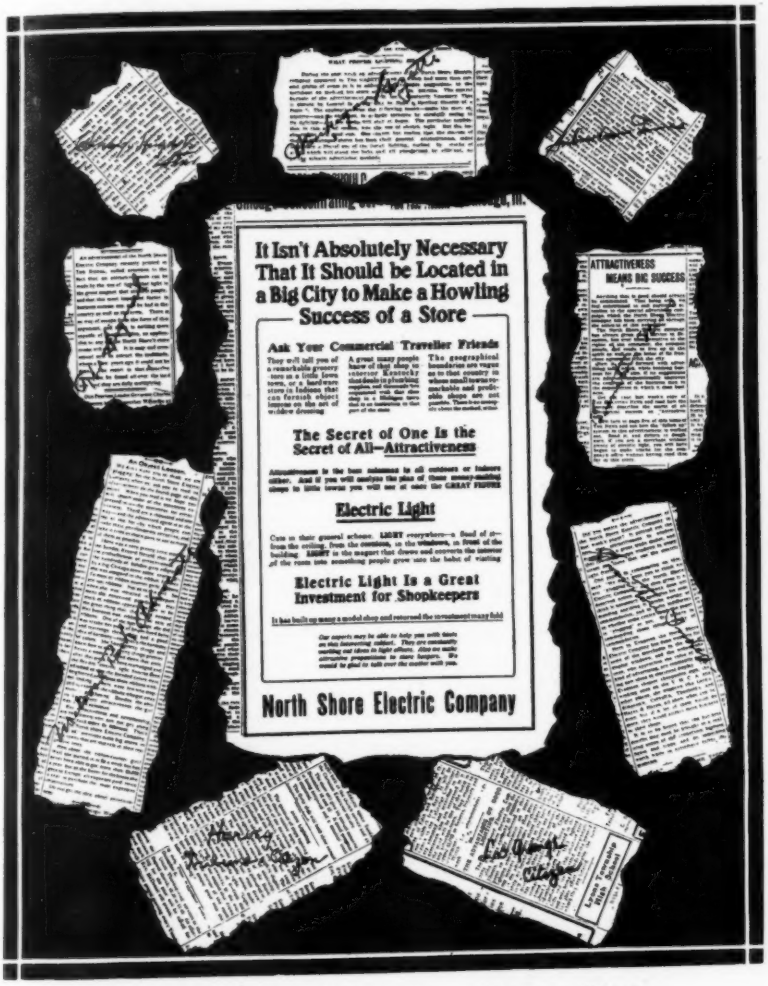
In addition to the consumers connected we have the following consumers in prospect on this line: A brick plant for lights and 200 horsepower in motors; two mines for 250 horsepower in motors; two saw mills for motor-driven pumps, to be used for fire protection, and several ranchers for lights and small motors.

This country is growing and it is expected that the revenue will increase substantially along this line.

Another extension was made by our company from Kootenai to Hope and Clarks Fork, a distance of 23 miles, this being a 13,200-volt line. The right-of-way was secured from the ranchers without expense to the company, as the ranchers were very anxious to have our service and realized that our line would enhance the value of their property. The business contracted for on this line includes a planing mill, where we will serve 185 horsepower in motors, lighting of mill, yard, office and an all-night sign; street lighting for both Hope and Clarks Fork; 125 lighting consumers and several small motors. The total investment on this line, including transformers, services, meters, etc., will be approximately $30,000, and the total anticipated revenue from business contracted for will be $7,500 per year. The amount of revenue received from this investment may seem small, in explanation of which the writer desires to say that Sandpoint has a contract for the purchase of power on a maximum demand basis. It was impossible to sell this power in Sandpoint and it was possible to take on this power business and sell the current as off-peak business.

Electric storage-battery locomotives are being used successfully in mills, mines and wherever industrial railways are used. This provides another field as does the electric truck, a field which is very desirable.

The new electric range offers great possibilities for building up a profitable business. This range consumes 500 watts, continuously storing heat, so that it may be used at will. With this appliance you have a load-factor of 100 per cent and at $5.00 per month (flat rate), the writer believes that a large number can be installed even in small towns, and this secures a revenue of $120 per kilowatt year, and requires no more additional investment on the company's part than an electric iron.


It Isn't Absolutely Necessary That It Should be Located in a Big City to Make a Howling Success of a Store
Ask Your Commercial Traveller Friends
The Secret of One Is the Secret of All—Attractiveness
Electric Light
Electric Light Is a Great Investment for Shopkeepers
North Shore Electric Company
ATTRACTIVENESS MEANS BIG SUCCESS

Circular of Public Service Company of Northern Illinois.

An Advertisement that Attracted Attention.

The accompanying illustration is a reproduction of a circular which the North Shore Electric Company, of Chicago, now the Public Service Company of Northern Illinois, has recently gotten out. In the center is an advertisement which was published in the newspapers of all towns served by the company and in the border are a few of the editorials evoked by the publication of this ad. As will be noted, the attractiveness of good light from a business standpoint is pointed out in a convincing manner. The company calls the attention of merchants to the fact that the secret of the success of any store, whether in a large or small town, is attractiveness and incidentally, it is stated, that "electric light is the magnet that draws and converts the interior of the room into something people grow into the habit of visiting."

Practically every newspaper in the towns served by the company commented editorially on the advertisement. The general spirit noticeable in all comments was to the effect that the electric company was deserving of great credit for taking the attitude it did in advancing retail business conditions, with the supply of its commodity as a secondary consideration. Several papers used the advertisement as the basis of an argument for better street lighting.

Electrical Construction

NOTES ON ELECTRICAL CONSTRUCTION.

By George J. Kirchgasser.

This is the fifth of a series of articles on electrical construction. The matter will be treated in a thoroughly practical manner, and will cover every phase of construction usually encountered by the electrical contractor or the electrician in an industrial plant. This article describes some of the materials and fittings of the electric circuit.

Fished Flexible Tubing.

In wiring old buildings flexible tubing is often used to protect the wires. Each conductor is placed in a continuous length of flexible tubing and the two wires of the circuit are usually tied together and pulled through partitions, laid between floors and ceiling or similarly installed elsewhere. Parts of concealed knob and tube systems are often run in this manner. Where the five-inch separation of wires cannot be maintained, each wire is encased in a separate piece of flexible tubing. In two-inch partitions tubing is also placed on each wire.

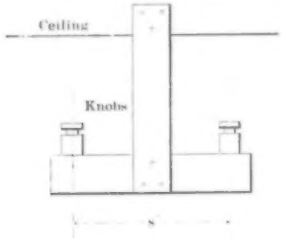


Fig. 1.—Method of Supporting Wires.

Flexible tubing is on the market under various trade names; as Circular Loom, Braiduct, Flexduct, etc. Braiduct, for instance, has four separate layers or walls, consisting of an inner insulating fibre, a moisture proof tape, and these, in turn are covered by two separate winds of braided cotton, flameproofed and treated with a moisture repellent. The interior is finished smooth to allow pushing a wire through easily. The following data covers the average commercial flexible tubing.

Motor leads also are very often protected by means of flexible tubing, the two, three or four wires, as the case may be, each separately incased and all cabled or bunched together by means of tape. At all light and switch outlets on concealed knob and tube systems each wire must be incased in a piece of flexible tubing extending from the last supporting knob. Wherever an extra protection is wanted for any purpose flexible tubing provides a ready means for accomplishing it.

Wiring in Special Locations.

In many industrial plants electric wiring must be installed to meet severe requirements. For example in breweries, packing houses, planing mills, cereal and flour mills, many difficult problems are presented and in all cases wiring in these plants—no matter what system is used—should receive regular and frequent attention to insure a reasonable minimum of defects.

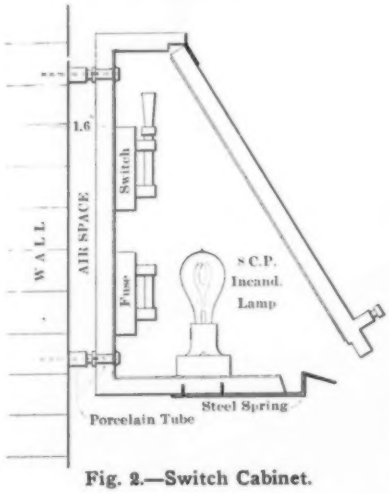


Fig. 2.—Switch Cabinet.

COMMERCIAL FLEXIBLE TUBING.

Inside Diameter. Inches.	Outside Diameter. Inches.	Largest Wire Contained. B.& S.Guage.	Feet per Coil.
¼	½	No. 14	250
⅜	⅝	No. 12	250
½	⅞	No. 8	200
⅝	¾	No. 4	200
⅞	⅞	No. 2	150
¾	1 1/16		

Wiring in Packing Houses.

Moisture, fertilizer, ammonia and acid fumes make it necessary to have the best and most lasting insulation for the wires here. Open knob wiring is best suited, as conduit, no matter how well painted and covered with asphaltum, will in time corrode. At the threads near junction and outlet boxes, which are the weakest parts of a conduit system, this corosion is most active.

The one-piece tie knob is often to be preferred here to split knobs, as the latter does not maintain as good insulation resistance as the tie knob. The moisture may work down the screw to the wire. Special blocks of wood well soaked with shellac or tar are first secured to the wall or ceiling and then on these the knobs are supported. This gives ample separation of the wires from the wall. Another method is to use a hanger as shown in Fig. 1. The wood used to make the hanger is of course treated also. This latter method of support has been used to a great extent satisfactorily in Kansas City, and has been found to prevent the moisture from getting from the ceiling to the knobs. The number of joints and splices should be kept to a minimum and special care exercised in taping. A cost of asphaltum paint over the tape keeps out moisture and ammonia fumes. Ammonia attacks copper vigorously.

Fig. 3.—Weatherproof Socket.

The location of fuses and switches is also important of the kind under consideration. These cannot be installed open on the walls because of the moisture, the ammonia and other corrosive

vapors, and also because of the liability to mechanical injury. In this case again all-metal cabinets have usually been found to be somewhat inferior to impregnated-wood cabinets, installed as shown in Fig. 2. These cabinets are

Fig. 4.—Special Type of Receptacle.

lined with heavy asbestos or transite board, set away from the wall and have a cover closing on a slant and having a small window. An ordinary eight-candlepower lamp is kept burning and this keeps the box dry and also makes it easy to find.

Porcelain, hard rubber or composition weatherproof keyless sockets may be used. Where porcelain sockets are employed they should be kept out of reach as they are easily broken. Weatherproof sockets, one of which is illustrated in Fig. 4, are usually soldered directly to the circuit wires by short lengths of wire. Fig. 6 shows an installation of weatherproof sockets also.

Brewery Wiring.

Many of the same conditions found in packing houses are also found in breweries, but usually in smaller degree. Rigid conduit systems and open knob systems of wiring have given good satisfaction here. In the tank cellars, wash rooms and compressor

Fig. 5.—Interior View of Pendant Switch.

rooms, the open knob system, described above, may have a slight preference. Where switch cabinets are not used waterproof switch enclosures are adapted.

Planing Mills, Cereal and Flour Mills.

Iron conduit is the best adapted for these plants. Key sockets should not be used as the dust may enter and cause a burn-out or an explosion. It is best not to install lamps in receptacles on the side walls as the dust will gather on the top side of the lamp and may result in fire. Fuses and switches should be enclosed in dust-tight cabinets. Rheostats used to start motors should also have casings. There are dust proof types on the market for this purpose, which are better than ordinary types enclosed in cabinets.

Chemical Works.

In chemical plants many out of the ordinary methods are used to prevent destruction of the insulation, fittings and the like, and a consequent grounding of the system. Metal conduit, slate and lead cable are all attacked; porcelain is not of course.

One plant uses with success the following methods. For inside work, weatherproof wires are buried in tarred grooves of hard wood molding, the base and cap of which are both painted and

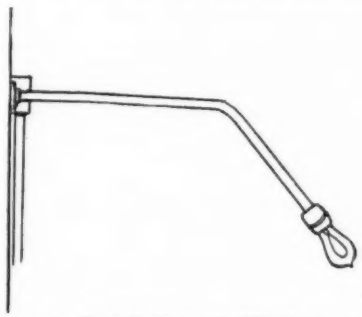


Fig. 6.—Installation of Weatherproof Socket.

heavily tarred before and after installation. Moulding receptacles are used for the lamps and a tarred ring of wire slipped over the lamp before it is screwed in place. This ring seals the opening between the lamp and the receptacle and prevents fumes from getting to the metal interior.

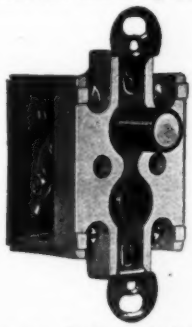


Fig. 7.—Surface Switch.

Sign Wiring.

Under the heading of "Multiple and Series Circuits" sign wiring has been referred to, but the method of installation of wires and lamps was not described.

For simple wooden signs where there is only one side to it procelain pig-tail receptacles are used. These are similar to the one shown in Fig. 4 but wires extending out the bottom or back are used for connection to circuit wires. To install these, holes are

Fig. 8.—Switch Base.

bored in the wood and the receptacle stuck through them. The pig tails are soldered to circuit wires run on knobs on the back of the sign. Joints in the wires are taped and painted.

Wooden signs of this kind are not used very much now, however. Metal signs in which all wiring is run as in a metal cabinet, are now used most. Special sign receptacles for the purpose are made which have terminal screws on the back instead of wires. The circuit wires are secured under these and soldered to make the contact permanent. Where the receptacles are placed close to each other, other support for the wires is unnecessary and a separation of one-half inch from the metal of the sign and about one and one-half inches between the wires is maintained. Double-braid rubber-covered wire is used because of the small separation and because of exposure to weather. All points, terminals and exposed parts are painted. The metal of the sign should also be galvanized, or painted to prevent corrosion and drain holes be provided in the bottom—a one-fourth-inch hole for

Fig. 9.—Pendant Switch.

each square foot of sign surface. No. 14 B & S gauge wire is the smallest wire used. The total wattage allowed on a sign circuit is 1,320 watts.

The making of electric signs has become a business within itself and about a dozen concerns now have approved signs on the market. Because of the number they make, the price

is lower than where they are made in smaller quantities.

In some locations wooden enclosed signs are also used. Pig-tail receptacles as used for open signs are used, connected to the double-braid rubber-covered wire which is run on knobs. This gives an inch separation from the wood and about five inches is maintained between wires. Joints are soldered, taped and painted. The leads are brought out of the bottom so as not to lead water or moisture into the sign.

Switches.

The various types of circuits and the different classes of wiring employed in the distribution of electric

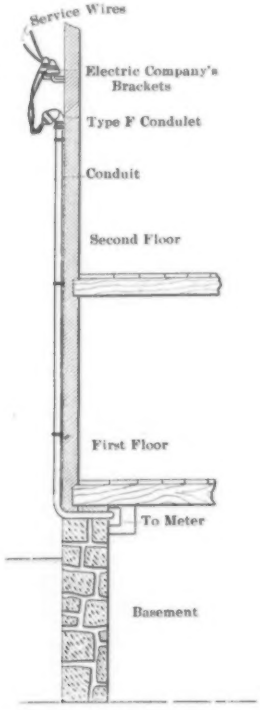


Fig. 10.—Overhead Service Connection.

energy within buildings having been described, it would now seem to be in order to introduce the further consideration of circuit accessories with a brief account of the switches used in interior wiring.

The following types of switches are in general use: The surface switch, made in both the open knife blade and the enclosed snap switch types; flush enclosed switches, which are set in the wall; pendent switches; and finally canopy switches, switches of the type last named being usually installed in the canopy or in some other part of the fixture itself. These types of switches are illustrated in Figs. 5, 7, 9 and 11.

On all but the flush switch and canopy switches the current and voltage for which the switch is designed is marked so as to be readily seen when installed. Flush and canopy switches are marked also but because of the manner of use this rating cannot be seen after installation.

Enclosed surface and flush switches are operated by means of a turning key or of push buttons. The circuit is closed and opened inside the enclosing case and therefore, where dust, lint, etc., are present and where accidental contacts are liable with open knife switches enclosed switches are especially valuable. In homes, offices, and similar places knife switches are not adapted, except where used in cabinets.

In making what generally is known as the "service connection" to a building—that is, in running the circuit which connects the building with the outside mains—knife switches are nearly always employed, the Code not permitting a single-pole switch in this class of work. There is such a lack of good practice in making service connections that one of the most approved services is shown in Fig. 10. The type of service illustrated applies only to cases where the wires are brought overhead from pole to brackets on the outside of the wall of the building. The best practice is to run the wires in conduit from the brackets into the basement, as indicated. As soon as the basement is entered, a fused knife switch is installed on the service side of the meter.

Surface snap switches when used with open wiring or moulding must be mounted on sub-bases so that the circuit wires will be separated at least one-half-inch from the surface wired over. Porcelain sub-bases as illustrated in Fig. 8 are usually used.

Pendant switches are often used with lamp clusters, and electroliers. They can be hung wherever desired and save wiring. Some are operated by means of push buttons located at the bottom and others by side push buttons, the latter being more easily handled.

In stores, and factories, and so-forth they find their greatest use. As with sockets the cord is knotted inside the cap so that no strain can be put upon the contact screws. The enlarged interior view Fig. 54 is of a Cutler-Hammer porcelain pendant and shows the knot in the cord.

Canopy or fixture switches are so called because they are installed directly in the fixture wall bracket, ceiling fixture, or base of portable lamps. Fig. 11 illustrates their application.

Where used with ceiling fixtures the expense of running wiring to a wall switch is eliminated. The switch is installed in the bottom shell of the fixture and the bottom knob is screwed onto the threaded stem of the switch. For wall brackets the threaded stem is replaced by a small knob.

Among the Contractors.

The Western Auto & Electric Company, of Belleville, Ill., has been organized to engage in the business of electrical contracting. The company will also install isolated electric plants.

The Seidler-Miner Electric Company of Detroit has been awarded the contract to install the electric wiring and apparatus in the new building of the Kales Realty Company, in Detroit. This firm has just completed electrical installations in the National Theatre and the Boyer Building, both also in Detroit.

The Herman Andrae Electrical Company, of Milwaukee, is installing the wiring for lights and power, and also for the telephone system, in the Merchants and Manufacturers' Bank Building in Milwaukee. This building, when completed, will be one of the most modern in the city. Conduit wiring is employed throughout, of course. The Herman Andrae Company has also

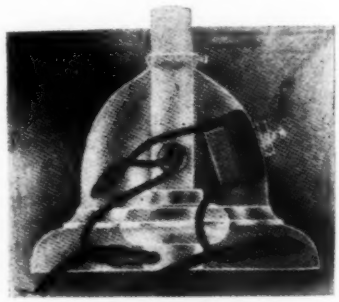


Fig. 11.—Canopy Switch.

lately completed the electric wiring in the post-office buildings at Beloit, Wis.; Fremont, Neb.; San Angelo, Texas; and Toledo, Ohio.

L. K. Comstock & Company, of New York and Chicago, are installing the electrical work in the Monroe, Otis, Malus and Rothschild's Buildings in Chicago. These are among the largest and most modern buildings in the city.

The Rex Electric Company has been incorporated at Decatur, Ill., with a capital stock of $3,000, to do general electrical contracting business. The incorporators are Earl H. Crawford, Alfred I. Clifford and Earl O. Weatherford.

John S. Lanigan, of Lincoln, Ill., has been awarded the contract for rewiring and installing new lighting fixtures in the city hall at Lincoln.

G. W. Alexander, an electrician and locksmith of Nashville, Tenn., has filed a petition in bankruptcy, giving liabilities at $1,046 and assets at $300.

Roy T. Risley, of Mt. Carmel, Ill., has sold his electrical supply house to his brother, Charles B. Risley.

The Rockel Plumbing & Electrical Company, of Zanesville, O., has changed its name to The Rockel Company.

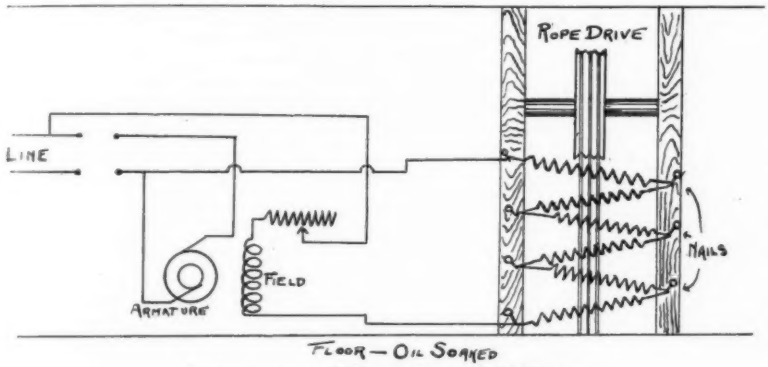
Earl Crawford, A. L. Clifford and E. A. Weatherford have opened an electrical supply and fixture house at 328 North Main Street, Decatur, Ill. They will handle all kinds of appliances and will do house wiring.

HAZARDOUS WIRING IN AN ELECTRICIAN'S SHOP.

By H. G. Wilson.

Inspection of conditions in electrical shops, shows that the other extreme of the safe installation of wiring very frequently exists. Copper wires are usually found in place of approved fuses; test sets of different kinds are built with no regard to safety from fire, and temporary work seems to be the rule instead of the exception.

Investigation of a recent fire in Chicago disclosed the usual conditions in a building partially occupied by an electrical concern in whose premises the fire started. The fire was started, apparently, by a resistance used in connection with a generator testing set, constructed in the following manner: Bare resistance wire about No. 16 gauge was wound in helical form about ½ inch in diameter, and supported horizontally by nails driven into a wooden frame surrounding the rope drive, which supplied power to the different floors.



Arrangement of Generator and Rheostat.

The wire was very loosely stretched across a distance of four feet between supports and crossed and recrossed in zig zag fashion from nail to nail, to about five feet above the floor as shown in the figure illustrating the arrangement of generator and rheostat.

The generator in this plant was used for testing small motors of different voltages. Its variable field resistance was sufficient to give a range of voltage from 110 to 220, and in order to obtain 55 volts this so-called temporary resistance was installed. One end was twisted on the terminal of the field resistance grid and the other, when in use, connected in series with the generator field by a "hook" joint, which when not in use, hung loosely almost in contact with the floor. The fire started during the night and followed up the rope drive shaft to the floors above where it caused considerable damage.

Convention of Wisconsin Contractors.

The ninth annual convention of the Electrical Contractors' Association of Wisconsin was held in Milwaukee, January 16-17. The officers elected for the current year are: President, John L. Acker, of Sheboygan; vice-president, F. W. Pitman, of La Crosse; secretary, Albert Peterman, of Milwaukee; and George Knoerr, treasurer.

The summer meeting of the association will be held in August at the Chain-of-Lakes, Wis. The members will assemble for this meeting at Oshkosh, and the wives of members will be guests of the association during the meeting.

Peoria's Police Signal System.

In Peoria, Ill., red incandescent lamps are placed in all of the police patrol signal boxes on the streets and when headquarters wishes to communicate with a patrolman, current is switched on to the nearest lamp. This attracts the attention of the patrolman, who reports at the signal box and receives his instructions.

LETTERS TO THE EDITOR.

Use of Tubes With Crossing Wires.

To the Editor:

In Fig. 2 of the "Notes on Electrical Construction" by Mr. Kirchgasser, page 82, in the issue of January 13, I notice a point which I should object to in inspection. In the middle column alongside the cut, the words occur, "Note also that a tube is used where one wire crosses another," thus calling particular attention to this construction point. In the cut the tube is shown on the lower wire so that in tightening its thickness tends to bring the upper wire closer in contact with the ceiling. In such a case I should require the branch wire to pass through the tube and *above* the wire to which the pendant is attached, so that the wire necessarily nearer to the ceiling is protected by the tube. It is a little point, but sometimes quite an important one.

WM. LINCOLN SMITH,
Municipal Inspector of Wires.
Concord, Mass., January 22, 1912.

Placing Porcelain Tubes in Joists.

To the Editor:

I must criticize the method of inserting tubes through joists by the extension of a long strip with nail in same, as given by A. S. Allen, Jr., in the issue of January 13. As a rule a wireman would never put tubes in the joists after all holes had been bored. While Mr. Allen was fishing with a stick in a dark place to find the hole not properly cleaned out, he would get tired of that and give up. Give me the ladder and slip your wires through the joists, which is done by hand, and then at the same time slip on your tubes. In other words, you can accomplish two things at once.

R. TINNEY.
Philadelphia, Pa., January 26, 1912.

Battery for Thawing Pipes.

Our Edison storage battery works overtime this zero weather thawing frozen pipes that are beyond plumber's reach.

The whole operation is to cut sections of frozen pipe in circuit with just enough cells to give proper temperature without burning, and results are immediate.

Running the batteries low does not harm them. This method is more flexible and less expensive than the use of a transformer.

G. W. BARLOW.

Automobile Engineers.

At the annual meeting of the Society of Automobile Engineers, on January 22, Henry F. Donaldson was elected president. The Society of Automobile Engineers has a membership of about 1,200, composed of the technical engineers and constructors in the automobile industry.

CONSERVATION OF ENERGY.

Another Letter to Electricians.

By George L. Forrest.

In a previous paper a few methods of conserving physical energy by the adoption and use of labor-saving tools by workmen engaged in electrical construction were discussed. The present article will deal with a number of further items involved in the actual installation of interior wiring, the application of which will, in the writer's opinion, lead to very satisfactory results for any worker in the trade. Though the ultimate results may be the same, there is a variety of methods of doing almost any given job in connection with wiring, the method too often depending on the man. With a view to pointing out the best methods and criticising the poorer ones these letters are written.

A new man at the trade in wiring open knot work and when making a straight run of some length, will invariably place his insulating supports the regulation distance apart and work from one to the next, thus making necessary the drawing taut of the circuit wires every 4.5 feet. Besides being tedious and involving much unnecessary energy, this method is not conducive to a good looking and straight job. While a new man is mentioned as most likely to do a piece of work in this manner, many wiremen get the habit and continue to use this method for all time.

To do the same work in half the time and with a minimum amount of exertion, secure the wires at one end; then at the farthest point from these knobs before making the first turn, fasten two more knobs at the same distance from the side walls. Now draw the wires taut and drive home the nails or screws used to fasten the supports. The run is now absolutely straight, and it is only necessary to go back and "fill in" with additional supports the regulation distance apart.

In the wiring of old houses the adopted system seems to be, in the upper-floor-circuit wiring, to bring one or two circuits—according to load—from the service entrance to the attic and then drop through the ceilings and walls for the various ceiling, bracket and switch outlets scheduled. This way of wiring is very good, and can not be improved upon in standard residence construction.

Wiring leads to first-floor outlets is another and much more difficult matter. A large majority of electricians proceed to take up flooring through the center of the house and at other seemingly necessary points, without stopping to plan any possible method of doing a large part of this work without the removal of any flooring boards whatsoever. The writer has in his experience encountered residences in which the removal of flooring and baseboards was altogether unnecessary in order to complete the wiring. In order to avoid such removal the conductors were run by the "fish" system of wiring, which is gone about in the following manner: All electricians know that the standard length of a 2 by 4 used in side wall and partitions in buildings is 22 feet. This means then that at that point above the foundation at which the ceiling joists of the second floor are supported by these uprights, there will be a clear drop in an open pocket to the first floor headers or foundation plates. There are exceptions to this, of course, as in a case where braces are employed between studdings and located midway between first and second floors, but these exceptions are rare. The proper procedure is first to cut all light and switch openings on the first floor. Then for fishing ceiling outlets provide yourself with 10 feet of No. 10 rubber-covered wire, an ordinary No. 5½ solid knob attached to about 40 feet of a medium strength and thickness of chalk line. Skin 2 inches of one end of this wire and bend a hook as illustrated in the figure.

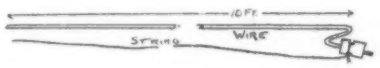


Fig. 1.

Assuming that you are fishing in a pair of wires for a ceiling-outlet hole, the hole having been already cut, you will proceed in about the following way: Straighten the fishing wire, except at the end, and slip the knob with string attached over hook shown. Now insert this end into outlet hole and work over toward the side wall by twisting the wire to right and left and at the same time pushing it forward, care being taken that there is at all times a slight retarding tension on the line sufficient to hold knob in place on hook. You can readily tell when the knob comes in contact with the side-wall sheeting. Now slacken on chalk line and give wire a sharp slip, which will chop the knob off the hook. The weight of the knob will easily carry it and the line down to bottom of the pocket.

At this juncture the helper should take his place at the outlet opening prepared to "shake up" the string, and the wiremen should go to the basement and "spot" the pocket and drill holes through which to fish out the string and pull wires through to opening into the room above. This method works equally well with both loom-covered wires and BX cable.

While the explaining of the foregoing system has taken considerable space, the actual accomplishment of drawing in the wires to the various openings is very rapid after a bit of practice. It should be understood, however, that this method of wiring is not applicable to all rooms in any particular dwelling. But in many cases where a window or door casing on the first floor would obstruct what would otherwise be a clear passage to the basement plate, there would still be a saving of cost if baseboard on second floor were removed and circuit offset sufficiently to clear the obstruction. There may be objections to this system on the grounds that the additional amount of loom required and the smaller labor cost involved, will not sum up to advantage as compared with the cost in removing flooring and baseboards. In the writer's opinion and experience this does not hold good; for an adept at this work proceeds with astonishing rapidity. In cases where BX cable is employed this system has every advantage.

Three-Wire Convertible System.

It is sometimes desirable to wire a building so that current can be used in either a two-wire or a three-wire system. In order to do this the usual method for a three-wire system is followed, but the neutral wire is made twice as large as each of the outside wires.

This arrangement is useful when the installation is ordinarily run as a two-wire system from its own power plant, but where central-station service is occasionally utilized on a three-wire system. When run as a two-wire system the two outside wires are thrown together on the same busbar. The scheme is often utilized also in an isolated plant where two generators are operated during the hours of full load upon the three-wire system. When the load becomes low, however, one of the generators is shut down, the system is converted to a two-wire system as indicated above and a single generator used to supply the entire load.

This arrangement is known as a three-wire convertible system. It is evident that it is not applicable when motors or other appliances requiring the full voltage of the three-wire system are connected across the outside wires. Where the system is a direct-current one the polarity on one side of the system will be reversed upon changing over, but this will ordinarily cause no inconvenience. The direction of rotation of a direct-current motor is not altered by reversing the polarity of the leads.

National Electrical Inspectors' Association

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11 Wareham St., Boston, Mass.

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Frank R. Daniel, R. P. Strong, Henry E. Knight
Washington Devereux, James B. McCarthy, Wm. Lincoln Smith
James Bennett, C. W. Mitchell
George L. Collison, T. H. Fritts, James S. Meade
Thos. Henry Day, James E. Cole, Thos. D. McColl

Secretary's Message.

A. J. Wheaton, city electrician, Saskatoon, Sask., Canada, has been elected to membership in the Association.

The secretary has received several letters evincing interest in the Association from persons unconnected therewith during the past month, and it would seem fitting, in view of the larger number of people under whose eyes these pages will from now on pass, to say a few words about the matter they contain.

The Association, in the first place, is a voluntary association for mutual benefit and interest, its officers are as appear in the heading above. Its members are: (1) active, those being confined to persons actually working in electrical inspection departments of insurance companies, in supply companies or municipal or state inspection departments, together with some few who have ceased actual inspection work since joining but have been allowed to continue their membership, as well as those who have been formally elected to honorary membership by the executive committee; and (2) associate, those being persons, firms or corporations who are interested in our work and who have all privileges except voting in elections for (or holding of) office.

Membership may be obtained by application to the secretary and approval of the executive committee, together with the payment of the annual dues and membership fee of one dollar. Members obtain, without further charge, the published matter of this department.

The foundation of the matter appearing monthly under the heading of the Association is questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods and tricks of wiring are or are not in accord therewith. These questions are gladly received from anyone interested even if not a member; they should be sent to the secretary with any elucidating sketch which may be needed, accompanied with the sender's name and address. They are sent out with no indication from whence they originated to the fifteen members of the executive committee, who each answers them according as the ruling would be, in his jurisdiction, to the best of his knowledge and belief. These answers are sent to the secretary, who has them printed monthly in the magazine and will if desired send an advance copy to the questioner.

The executive committee is intended to be representative not only geographically but also of insurance departments, municipal departments and supply companies. The municipal departments are represented by T. D. MacColl, of the Interior Division, Inspection Department, of Toledo, Ohio; Henry H. Knight, supervisor of wires, Worcester, Mass.; J. E. Cole, commissioner of wires, Boston, Mass.; W. L. Smith, inspector of wires, Concord, Mass.; H. S. Wynkoop, electrical engineer, Bureau of Electrical Inspection, New York. The insurance departments are represented by James S. Meade, Underwriters' Association of the Middle Department; F. R. Daniel, engineer, Indiana Inspection Bureau; R. P. Strong, engineer, Louisiana Fire Prevention Bureau; Washington Devereux, Philadelphia Fire Underwriters' Association; C. W. Mitchell, inspecting engineer, Board of Fire Underwriters of the Pacific; James Bennett, chief inspector, Canadian Board of Fire Underwriters; G. L. Collison, inspector, Underwriters' Association of the Middle Department; T. H. Day, inspector for the New England Insurance Exchange. T. H. Fritts, Grand Island Electric Company, Grand Island, Neb., and Jas. B. McCarthy, ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, are the remaining members.

It should be understood that no pretense is made in this work to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which committee is responsible for the Code, but it has no right, nor has it ever claimed to have any right, to give a final interpretation of any rule, sentence or word of the Code.

All we intend to do is to give, for the benefit of our members and other persons interested, an interpretation of the Code where it is desired, as seems correct to those representative gentlemen who compose the executive committee. It will usually be found that the replies received are in entire or substantial accord, but sometimes this will not be the case, and in this event the several answers are given as received, no attempt being made to edit them, reduce them to harmony or indicate which is correct. It has been suggested that this be done, but it would require machinery not as yet arranged and in some ways a detriment. Where a divergence of views exists it has been found that one result is to lead to a re-examination and new study of the Code in the light of the several points of view. Both parties to a controversy are led to reconsider their several views, and as a good many letters show, much good is accomplished. No contractor should have the idea that any verdict here found may rightfully be used as superior to the ruling of the Inspection Department having jurisdiction in the case at hand, nor should any inspector feel that he must accept such a verdict if he and his superiors doubt its correctness.

Our desire is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it, and harmonious action by those using it, for the common good.

If the questions and answers lead to renewed study, stimulate us to think for ourselves in the light of other men's ideas on the subject at hand they will be of great value. When one has his nose close to a problem he often finds his views obstructed by something which appears enormous (just because it is out of focus), but when, through other fellows, he succeeds in viewing it from a distance, he finds the relation of things widely changed.

Finally the secretary desires to emphasize that this work needs material; we must have questions to work on, and he desires most urgently to request that all interested send in questions, even apparently trivial ones, for they often open up unexpected avenues of interest. Members of the Association may send him little notes and incidents concerning their field work available at any time and likewise curiosities in the way of wiring or fittings found in use. Comments and criticisms will always be in order, too. In short, any matter of in-

terest to inspectors will be given space. The secretary would like to secure sufficient material to make it possible to run our department twice per month instead of monthly as heretofore. DON'T WAIT. SEND THEM NOW.

Grounding of Conduit.

Question 159.—A contractor recently stated that he had been told by the inspector that if he ran a certain circuit (2-wire Nos. B. & S.) 145 feet in length, in exposed conduit one foot below the ceiling in a fire-proof building, the same having several branch taps about eight feet long terminating in knife switches, and placed boxes at the branches with cut-outs within them, the conduit must be grounded; but that if he led the branches out through porcelain-covered fittings of the "condulet" type into exposed cut-outs and thence in open wiring to the switches he need not ground it.

This apparently makes a distinction between the two—the former a conduit system, and the latter coming under Rule 28-f, Ed. 1911, exception and reference to Rule 26-c. Is this correct and if so where is the distinction to be made and the line drawn between "mechanical protection" and "conduit wiring?"

Answer 1. I think the inspector is in error, as in my understanding of Rule 28-f, it is only intended to exempt from grounding a piece of conduit or pipe of equivalent length where same is installed to protect wires from mechanical injury on side walls; otherwise, conduit should be grounded.

Answer 2. This appears to be an exceedingly liberal interpretation of that provision of Rule 28-f, allowing the omission of the ground for conduit used for side wall protection. It seems that the distinction drawn by this inspector between "conduit" and "mechanical protection" is that a conduit system includes the running of the pipe into outlet boxes, switch boxes or cut-out cabinets, and this distinction I think is about the best one that could be made under the circumstances. The same distinction is made in this territory with the exception that the omission of the grounding is allowed only on conduits carrying vertical wires, there being a strong inference in Rule 26-e that the mechanical protection therein described refers only to vertical lines. This department does not believe that it is wise to allow the omission of grounding on any form of conduit, as we have records of a number of accidents caused by pipe on side-wall protection becoming "alive"; also the permission to omit the ground on these sections of pipe is inviting just such disputes as this present question seems to indicate. We presented an amendment at the last meeting of the Electrical Committee which would require grounding on all sections of conduit, but for some reason it was not approved.

Answer 3. I should consider this a conduit system and require that it be grounded. I have always considered that it was intended that only a very short length of conduit should be allowed for mechanical protection. The expression "short sections of conduit" in Rule 28-f conveys no definite idea of length when considered alone, but when coupled with that part of Rule 26-e which states that "protection on side walls must extend not less than five feet from the floor," it is evident that by specifying that this short piece of conduit must be at least of a certain length (five feet), it is not expected that it will ever exceed that length by any great amount.

Answer 4. The inspector in case outlined is apparently in error, as the conduit in this case should not be considered as for "mechanical protection," but should be governed by Rule 28-f and the proper ground connections provided. Grounding of conduit should only be eliminated as specified in Section 26-c, where same is used for mechanical protection on side walls.

Answer 5. The Code does not warrant any such distinction. The exception cited in Rule 28-f, allowing omission of grounding, applies only to "short sections of pipe used for protection on side walls," and, by implication at least (see 26-e, paragraphs 2 and 3) in a vertical position. The ruling as presented by your question, besides being unauthorized in the Code, puts a premium on open-work construction in preference to the better and more substantial conduit work.

Answer 6. I question the veracity of the contractors, as I fail to see why an inspector should differentiate in judgment relative to the two cases quoted, as they appear to be of such a nature as to demand the same interpretation.

Answer 7. The evident intent of No. 28-f is to prevent an inspector from requiring (as has been done in the past) that short lengths of conduit, which are used as a substitute for open wiring on side walls in order to guard against mechanical injury, shall be grounded, thus involving the use of ground wires which have to be run in long distances in order to secure a suitable ground attachment. I should rule that all pipe work not included in the above explanation must be grounded in order to comply with the Code, there being one exception, however; viz., the case of iron pipe made up into a fixture in such a way that an insulating joint would be demanded in accordance with No. 30-a. One must resort to common sense to determine the line between "mechanical injury" and "conduit wiring."

Answer 8. I think this is a mistaken ruling; such a length of conduit as this should be grounded regardless of the particular type or types of fittings used with it. I think, however, that there is a distinction between this and a conduit system, and my reason for demanding grounding would be simply on account of the length of the protective conduit. Incidentally it may be observed that the question brings out a fine point in the Code, which is as follows: It is obvious that the case comes under 28-f and the exception found in the third sentence. It is clear that the definite phrase "on side walls" occurs here, and many inspectors limit the permission to protection thereon and some still further to vertical runs (I presume by implied refer nce to Rule 26-e). This rule is referred to in Rule 28-f, and if we turn back to it we find in the fine print note a special emphatic indication of the use of pipe near belts, pulleys and so forth. I have a number of times met with cases where wiring was being done on cleats or knobs and where a piece of pipe was used for protection over or near a short length of shafting. I have in mind one where a house was wired, knob and tube, and where the owner put in his basement (which was wired on cleats, waterproof construction) a sheathed off-room, with several machine tools which he drove with a moderate-sized motor. The wire in two places came near his shafting and I had it encased at each point in about four feet of pipe with a condulet type fitting on each end. To ground would have necessitated a run of fifty-four feet, and I did not call for it. It seems to me that such a case is certainly one where the "side wall" phrase should not be too strictly held to, and the grounding would have been rather a farce, as the water system piping is concrete pipe and the soil of dry sandy nature.

Answer 9. The installation of 145 feet of continuous conduit would ordinarily come under Rule 28 and therefore require grounding regardless of how the branches were taken off. But if the conduit was used for mechanical protection and the contractor saw fit to reinforce the feeders with flexible tubing as required in Rule 26e, there should be no objection to omitting the ground. Of course, the element of cost enters here and prevents the use of tubing on such a long run. And for

this reason there is no place where the line can be drawn between mere "mechanical protection" and "conduit wiring"; expense will always regulate it.

Switch Box and Outlet Box.

Question 160. A conduit is run from a cellar to a switch box, as shown in the illustration, carrying four circuits which then pass to four outlets, each carrying 660 watts. Is the four-gang switch-box an equivalent of an outlet or junction box, so as to make the installation conform to Rule 28-b, Ed. of 1911 (25-b, Ed. of 1909)?

Answer 1. The four-gang box shown in sketch is not intended to be considered as an outlet or junction box. It is just as it shows, a four-gang switch-box which should be considered as coming under Rule 28-e.

Answer 2. Switch-boxes and outlet boxes are made under the same specifications (Rule 59), and therefore the installation in question shows no violation of Rule 28-b.

Answer 3. If flush switches are used Rule 28-b would be complied with, as the rules for the construction of flush switch-boxes are the same as those for the construction of outlet and junction boxes.

Answer 4. The installation as outlined in diagram apparently meets the requirements. The writer can see no objection to the use of the switch-boxes as an equivalent to a junction box, and believes that Rule 28-b has been complied with.

Answer 5. Yes. A switch-box is an outlet box, as truly as is a box for a chandelier, a bracket light, a receptacle, or a drop light.

Answer 6. The gang switch-box installed as shown in sketch would fulfill the requirements of 28-b, Ed. 1911, National Electrical Code.

Answer 7. In reply to question asking whether a four-gang switch box may be inserted in a conduit line without rendering the line discontinuous and violating No. 25-b (Ed. 1909), I would say that such a switch-box is a standard conduit fitting and is equivalent to an outlet box or to a junction box, and I see no reason to object to its use as indicated.

Answer 8. I can see no reason why the arrangement is not perfectly proper.

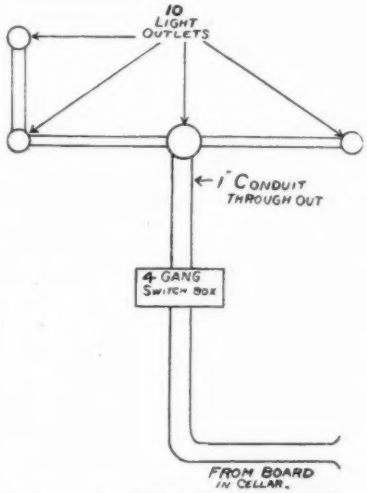
Answer 9. The four gang switch box is both a switch box and a junction box. This is true of all outlet boxes, whether used purely for junction purposes or otherwise. Its installation must therefore conform to Rule 28-b.

Telephone Wires in One Tube.

Question 161. Rule 85-d, Ed. of 1911, reads as follows: The wires from the last outside support to the cut-outs or protectors must be of copper and must have an approved rubber covering. Must be provided with drip loops immediately outside building and at the entrance.

These words have been dropped: "Must be kept not less than two and one-half inches apart, except when brought in through approved metal-covered cables."

Does the omission of these words lead to the allowable carrying of both wires of a twisted telephone pair into the building through one porcelain tube? If so, what additional precaution should be taken inside the building?



Positions of Switch Box and Outlets.

Answer 1. In reading Rule 85-e, which, in my opinion, should be read to explain the requirements of the rule, bushings are specified, consequently one porcelain tube would not be sufficient, and the separated pair should be run through separate bushings.

Answer 2. A twisted pair telephone wire is not an approved cable, and therefore sections c, d and e apply. The inference is that the use of the plural form of the word "loops" in section d and "bushings" in section e requires separate insulating bushings for the entrance wires.

Answer 3. I believe that the omission of the requirement for spacing in Rule 85-d permits the use of a twisted pair of telephone wires.

Answer 4. It would seem that the interpretation of these requirements would permit of twin telephone conduits entering through one tube.

Answer 5. Yes. No additonal precautions are required under these conditions.

Answer 6. The intention of this change noted in question as referring to Rule 85-d, 1911, is to permit in signaling systems of the two wires entering through a single hole properly bushed. This, of course, assumes that the protective device which service wires enter must be at the immediate point of entrance of service wires in the inside of building.

Answer 7. I understand that the omission of the requirement of two and one-half inches separation was made for the express purpose of permitting the twisted telephone pair to be carried without splices directly into the building. There seems to be no necessity for the taking of any additional precaution inside the building, as a twisted pair fans out immediately after leaving the tube in order to enter the protection.

Answer 8. The words quoted were omitted, as I understand, for the express purpose of allowing both wires to enter through one tube, and I understand the New England Telephone & Telegraph Company has already adopted this as standard construction. I have approved it in this jurisdiction.

Answer 9. Although the use of the plural in the Code references to wires and bushings here might lead one to suppose that entrance by means of a twisted cable was not contemplated, I should be ready to approve construction of the character referred to. I cannot see why a satisfactory entrance may not be made through a single tube.

Illuminating Engineering Meeting in Philadelphia.

A meeting of the Philadelphia Section of the Illuminating Engineering Society was held at the Philadelphia Electric Company's building on Friday evening, January 19. The program opened with a fifteen-minute educational talk by A. J. Rowland, director of the School of Engineering, Drexel Institute. By means of a few demonstrations with simple apparatus, the theory of the origin of light waves, sound waves, etc., was made plain.

The papers of the evening were: "The Architect and the Illuminating Engineer," by V. R. Lansingh; and "Illumination of Interiors by Daylight and by Artificial Light," by L. B. Marks. E. L. Elliott also addressed the meeting. Lawrence V. Boyd, W. J. Serrill and R. B. Ely took part in the discussion, which was followed by a biograph picture of "The House Electrical."

W. A. Castor exhibited some gas meters and explained their mechanism.

Public Service Commissions

WISCONSIN.

The Commission has dismissed the application of the State Long Distance Telephone Company for an increase in telephone rates. The rates petitioned for, amounting to an increase of $1.00 per month for business telephones and 25 cents per month for residence telephones, were applied for chiefly on the ground that the proposed extensions and betterments of the service would materially decrease the net revenues. As the result of such an investigation as it was possible for the Commission to make, because of the improper methods of accounting employed by the petitioner, it was apparent that the company was earning approximately 16 per cent upon a liberal valuation of its property. After making due allowances for all increases in operating expenses which might result from the anticipated improvement in the service, it was evident that the rate of return would still be better than 14 per cent. It was pointed out, however, that these estimates were necessarily approximate and that proper accounting methods might reveal in the future that a change in rates was merited.

Exercising its duty under the law to prevent injury to business and public interest, the Commission has refused to approve the amendment to its rate schedule filed by the Kenosha Gas and Electric Company, which provided for a marked decrease in its charges for commercial electric lighting in the city of Kenosha. This decision was made in answer to a petition from the Kenosha Electric Railway Company, a competing utility in Kenosha, in which it was alleged that the amended rates were insufficient and unreasonable and that the reduction was made with the purpose of commencing a rate war and injuring the petitioner's business. Upon investigatigating the matter, the Commission was convinced that, notwithstanding the reasons urged to the contrary, the defendant company in reducing its rates was actuated by the same motives as usually actuate any company when entering upon a rate war. Commenting upon the effect which rate wars produce, the Commission says "Rate wars mean lower-than-paying rates, failure to keep the property in proper operating condition, and inadequate service. It usually results in financial ruin to one or more of the contestants, the crippling of the rest, and in the ultimate consolidation of the remnants into one concern. When peace has thus been restored, the rates are advanced, not only to the level that prevailed before the contest, but to even higher figures. This is often necessary, because it is frequently the only way in which the public can secure adequate service. These results, if the war were permitted to go on, could not be prevented or more than tempered under the Public Utilities Law, for the only way bankrupt corporations in the hands of receivers can be made to furnish adequate service to the public is through the additional investment of enough capital to restore the plants to efficient operating condition and by fixing rates that are high enough to yield reasonable returns for operating expenses, including repairs, depreciation and interest charges on the entire investment. In one way or another losses and destruction due to rate wars are almost certain to fall on the public; and in the end the customers of such utilities will lose more through such losses and through bad service than they gained through the temporary reductions in the rates while the war was on. Rate wars also have a demoralizing effect upon business methods and practices and usually result in future dissatisfaction and strife. In the public-utility field they are so clearly against public policy that they should under no circumstances be permitted."

The existing net rates of the company range from 11.4 cent per kilowatt-hour for the first 50 kilowatt-hours to 5.7 cents for the fourth 100 kilowatt-hours used per month, with a rate of 3.8 cents for all over 600 kilowatt-hours. The proposed amended rates provided for a charge of 5.7 cents for the first 400 kilowatt-hours per month and 2.97 cents for excess. According to the company's certified figures, the cost per kilowatt-hour of the commercial lighting current sold during the year ending June 30, 1911, exclusive of interest upon the investment and including but a portion of the depreciation charge, was 6 cents or a figure greater than would have been received under the amended rates. Upon the same basis, the Commission found that the actual cost per kilowatt-hour ranged from 10.73 cents, for one hour's daily use, to 3.86 cents for ten hours daily use. Not only were the proposed rates too low for public safety, but they were discriminatory. The Commission held that public interest demanded that the rates complained of be altered by being raised to a somewhat higher level and there maintained until the investigation of the reasonableness of the rates in Kenosha, now pending before the Commission has been completed and the final order made. The Kenosha Gas and Electric Company was therefore ordered to discontinue its amended schedule of rates and was given the option of either reinstating the old schedule or of adopting temporary rates provided by the Commission, the latter being substantially the same as the ones now charged by the Railway Company.

MARYLAND.

Electrical contractors of Baltimore have appealed to the Public Service Commission to protect them from the Consolidated Gas, Electric Light and Power Company, which, they assert, is taking their business from them. The matter was brought to the attention of the Commission by the Baltimore Electrical Supply Company a week ago, and since then letters have been filed with the Commission by the Blumenthal-Kahn Electric Company, Goldenberg Brothers, Incorporated, the Central Electric Company, W. S. Rosenfeld Electric Company, Durling Electric Company, the Joseph M. Zamoiski Company, and others. The agitation began with the opening by the Consolidated Company recently of a handsome store on one of the main thoroughfares of the city, for the sale of electrical appliances of all kinds. Prior to that time it had gone into the business of wiring houses for electricity, and had conducted an extensive advertising campaign.

The matter of the complaints was referred by the Commission to its general counsel, W. Cabell Bruce. He advised the appointment of a day for a hearing, as requested by the complainants. At the same time it seems that the Commission will be able to give them but little relief, notwithstanding the fact that they are likely to be driven out of business. According to the Maryland law a corporation formed by the consolidation of

two or more companies acquires the rights granted by the charters of the constituent companies, unless such rights are voluntarily surrendered. In this case the Edison Company, one of the companies absorbed by the Consolidated, had the right under its charter to engage in the manufacture and sale of electrical fixtures and equipment of all kinds, and to wire buildings.

If the Commission is unable to give the contractors any relief, they expect to appeal to the Legislature, now in session.

Charles M. Cohn, vice-president of the Consolidated Gas, Electric Light and Power Company, told the correspondent of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN that his company had engaged in the wiring business primarily because of the difficulty of getting electrical house-wiring done according to the company's specifications, and that the sale of fixtures was an outgrowth of the wiring business. He denied that unfair competition was practiced and said that the company was making a reasonable profit from the wiring and fixture business. Its principal advantage lies in the fact that it can afford to do the business on the installment plan, so much a month for wiring and fixtures being charged in with the regular monthly bill for electric current.

MASSACHUSETTS.

Under an order of the Legislature in 1910 the Board of Gas and Electric Light Commissioners was required to report on the use of demand indicators, and this report has just been made to the present legislature. The report of the Board contains some interesting records of tests on the accuracy of demand indicators, also a form of bill to provide for the testing of such indicators and imposing fines where they are found to err against the consumer by more than a certain percentage. As to the general expediency of the use of demand indicators and the differential charges for service incident thereto, the Board says in its report: "The Board believes that the available experience is not yet sufficient for reaching any just or final conclusion as to the expediency of prohibiting or restricting differential rates. The use of demand indicators, as already pointed out, is so intimately involved in this problem, that, for like reason, it seems at present inexpedient to prohibit or restrict their use. On the other hand, the Board is emphatically of the opinion that it is not in the public interest that any Legislative sanction or approval, directly or indirectly, shall be given to differential rates."

NEW JERSEY.

The Board of Public Utility Commissioners of New Jersey has filed a memorandum defining its position with respect to minimum charge for lighting service exacted by electric lighting companies. In this memorandum the Board directs attention to the fact that it has given consideration to the following allegations contained in complaints received by it: (1) that a minimum charge is unnecessary and unreasonable and should not be made; (2) that if imposed at all, it should be made by the year and not by the month; (3) that it should not be made when the service is not needed, as when a residence is closed temporarily during the summer months. The third point at issue applies to service furnished at seashore or other summer resorts where dwellings are closed for from six to eight months in the year.

The Board's finding reviews the history of the development of public utilities, and refers at length to decisions of Commissions in other states. The conclusions of the Board are that the exaction of a minimum charge is a reasonable rule or regulation for an electric lighting company to make; that the making of this charge by the month is just and reasonable and is really more equitable than if the charge were made by the year; that a charge of $1.00 per month "per plant or installation" is just and reasonable, but that a charge of $1.00 per meter is excessive where more than one meter is installed. A minimum charge of 50 cents per meter per month is not considered excessive or unreasonable for each additional meter installed on the same premises for the same customer, supplied through the same service. Where a customer requests that service be discontinued for a period of at least one month or more, the minimum charge should be waived during such period. Where a customer requires service for a limited period only, a reasonable charge may be made for the work of connecting and discontinuing the service at the beginning and the end of the short period. Rules and regulations concerning service and all information in regard to rates and rate schedules should be available to the present or prospective customer. The minimum charge is regarded as part of the rate schedule and should be incorporated with such schedule whenever it is compiled for examination by the public.

Accompanying this memorandum is another filed by the Board dealing with minimum charge for electric power. The Board announced with respect to this that it does not regard a minimum charge of 50 cents per horsepower per month as excessive or unreasonable, and further determines that a minimum charge for electric power service of $1.00 per month is likewise not excessive or unreasonable.

In announcing its conclusions, the Board refers to the same as defining its position with regard to the exaction of minimum charges by electric light and power companies in general. It has stated that in special cases where peculiar local conditions exist, the Board's position would be modified to suit such cases, upon reasonable ground for such modification being shown.

On January 19, the Board heard at a meeting in Jersey City the complaint of Alexander A. Altshuler against the New York Telephone Company in regard to charges made by that company for long-distance calls. The Board decided to dismiss the complaint with the understanding that it would, on its own initiative, investigate the subject of the complaint, in connection with an examination of rate schedules filed by the New York Telephone Company. A hearing was given on the same day upon the complaint of the Hackettstown Telephone and Telegraph Company against the Delaware and Atlantic Telegraph and Telephone Company and the West Jersey Toll Line Company. This will be continued at another time.

NEW YORK.

The Pubic Service Commission has received from its chief engineer a report upon the progress of work on the Lexington Avenue, the Fourth Avenue and the Brooklyn Loop Subways up to January 15, 1912. By this report it appears that work is actually in progress on six sections of the Lexington Avenue Subway and about ready to begin on another section; that nearly four-fifths of the contract value of the work has been done on the Fourth Avenue Subway, and that on Section 9-0-1 of the Brooklyn Loop Line, the only section of that line remaining uncompleted, the excavation is 61 per cent completed, the concrete 14 per cent completed and erected steel work 12 per cent completed, or about 30 per cent of the value of the work.

The Public Service Commission, Second District, has just announced an interesting decision in relation to the duty of a natural-gas corporation which is a producing and distributing company toward other corporations distributing natural gas, in which it holds that it has jurisdiction to hear a complaint made by a distributing corporation as to why the producing corporation should not be required to supply natural gas on the same terms that it is now supplying another distributing company in the same locality. In the

village of Attica the Attica Water, Gas and Electric Company and the Attica Natural Gas Company are competitors supplying natural gas in that village. The Alden Batavia Natural Gas Company is a producing and distributing corporation and supplies the Attica Natural Gas Company. It has refused the demand of the Attica Water, Gas and Electric Company to be furnished with a supply of natural gas at the same rate at which it furnishes the Attica Natural Gas Company. The producing company has held that the Commission had no power to compel it to enter into a contract with the complainant in this case. The Commission holds that it has the power to hear this complaint and make an order if, after hearing, it decides that one should be made.

Among the Supply Men

AN ORDER BLANK AND INVENTORY CHECKING SYSTEM.

By C. Warren Cook.

The system here described can be put into effect in a great many different institutions and when it is properly understood will be found equally applicable to the contractor, dealer or big supply house. The system is used at present in a large automobile works and it eliminates the looking up of the monthly sales when taking an inventory, as all information required for the inventory is kept on the cards.

The cards are made in duplicate, printed on white and pink stock, and they can be made up cheaply by any printer. The most convenient size appears to be four inches by six inches, and the spaces in the card system illustrated herewith can be changed to meet the different requirements of different branches of business. In the shop where the system is now used the white card is kept in a tin receptacle on the shelf alongside the article, and the pink card is kept in the office. The pink card is made out by a clerk from the sales or charge slips issued to him by the store keeper who makes a slip for every sale and for all material issued to be used on a job. The pink cards are then compared with the white cards on the twenty-eighth of each month so that the inventory can be sent to the factory by the first of each month. The following is a detailed explanation of the system of using this card:

With any article, a maximum stock to be carried is set according to its use. In this case we will assume, 25. For wires, etc., it can be 25 pounds. A minimum stock amount is also set at 10. The catalogue, catalogue number, name of the article, section of shelving the shelf number and the price are all given on the top of the card. With a maximum of 25 and a minimum of 10 we will start our system. We are now ready to use the card. We will have a stock of 25, which is under "balance." An order is received for 15 and they are delivered, and 15 is put under "delivered." We now have only 10 left in stock, which is now at minimum. This 10 is entered under "balance," as the balance is always the stock on hand. When we reach the minimum as in this case, enough should be ordered to bring it up to maximum. On 1-10-'12, 15 were ordered and these are entered under "ordered." Under "received" we also enter the 15. As we already had a stock or balance of 10 our total stock is now 25, which is now entered under "balance." The next order received was for 6, which left 19 in stock. Then an order for 12, which left only 7 in stock. As this is below minimum we will now order enough to bring us to maximum stock, or 25. Therefore, we will say, on such a date an order was sent in for 18, which is entered under "Ordered" as 1-15-'12—18. When the 18 are received they are listed under "received" and the balance is 18+7, or 25. I have used Edison pony cleat receptacles as an example. From a glance at the card it is easily seen how many were received during the month, how many were sold and what is the present condition of the stock.

MAXIMUM 25			SECTION A	SHELF 12			MINIMUM 10
ARTICLE Edison Pony Cleat Receptacle.							
CATALOG MODEL B&P			CAT. NO. 50715	PRICE 10¢ ea. $1.00 doz.			
REC'D.	DEL'D.	BAL.	ORDERED	REC'D	DELV'D	BAL.	ORDERED
		25					
	15	10	1/10/12 - 15				
15		25					
	6	19					
	12	7	1/15/12 - 18				
18		25					

Card for Checking Inventory.

Supply Men and Their Interests.

The Southern Wesco Supply Company held its annual meeting and salesmen's convention at Birmingham, Ala., on Saturday, January 22. The salesmen of this company reported very satisfactorily from their different territories. The company covers the states of North Carolina, South Carolina, Florida, Georgia, Alabama, and half of Mississippi and Tennessee. The officers of the company were re-elected at the annual meeting as follows: Oscar C. Turner, president; Roger V. Scudder, vice-president; William M. Bowles, secretary; John D. Turner, treasurer. Besides being a mighty busy supply man, Oscar Turner is in the political limelight, boosting Oscar W. Underwood as a presidential possibility. Mr. Turner has been elected president of the Underwood Marching Club, the ranks of which are swelling very rapidy.

ELECTRICITY VERSUS WAX IN RELIGIOUS WORSHIP.

By Roscoe Scott.

If one were to judge the importance of the candle by reading up the technical discussions of illuminating engineers—in which it is (naturally enough) seldom given more than passing mention—he might readily opine that it had fallen to an almost insignificant place in the ranks of competitive illuminants, if, indeed, its use were not confined entirely to peasants and plumbers. As a matter of fact, the manufacture and consumption of this time-honored commodity are increasing (at the rate, according to one authority,[1] of about 10 per cent per year) in spite of the frequent reductions in the cost of electric lighting which have been effected by advances in the electrical art.[2] While this may be a source of chagrin to those who hope for the universal adoption of latter-day illuminants, it is the less surprising when we consider what a large and steady demand is furnished by a single class of consumers—the churches, with their stocks of tapers and candles easily running into the millions. The whole English-speaking world, on February 2 of every year, unconsciously helps sustain the prestige of the candle by the name it has given that day—Candlemas—not to mention the enormous quantities of lighted candles which in the Catholic churches are then carried in solemn procession.

The idea of keeping fire of some kind before consecrated objects may have originated in the extreme difficulty of obtaining "elemental fire" in pre-historic times, and the consequent extreme convenience of a central kindling-flame; at all events it has been associated with religious worship by people of all races; it exists in Chinese joss-house as well as in Christian cathedral, and it was ancient even when the Vestal Virgins guarded the sacred fire of Rome.

Tons of candles are burned every year on the altars of Episcopal and German Lutheran churches and on those of the Roman Catholic churches. The use of lights in the public worship of the Catholic church is governed by detailed ecclesiastical regulations which in general prescribe the minimum quantity and quality of candles to be used on various occasions, but do not prohibit the use of a greater number, and in fact the minimum is usually exceeded. The extra candles, it is generally conceded, need not be of wax or tallow; they may be miniature incandescent electric lamps mounted on cylindrical supports, and in several respects these pseudo-candles—"electric candles," with apologies to Jablochkoff—are superior to those they are supposed to represent.

It may be of technical interest, prior to a further consideration of its uses in religious worship, to compare the primitive form of candle with the electrical form along the lines that are usually taken up in studying the respective merits of competitive illuminants. First, however, a word on the evolution of candle manufacture, lest anyone should misconstrue the use of the word "primitive" as applied to the product. As a matter of fact, while the candle itself is of ancient invention and, barring fancy shapes, has retained its primitive simplicity of form throughout the centuries, the candle industry is today in an advanced state of scientific development.

The date of the candle's introduction is unknown. In its operative aspect merely an "allotropic form" of oil lamp—having a solid oil supply and a self-trimming wick through which the oil is drawn up into the flame—it seems historically to have been of later origin than the liquid oil lamp. Contrary to common conception, the golden candlestick, one of the Hebrew tabernacle appurtenances described at length in Exodus, was not a support for candles, but for oil vessels, for which "tongs" and "snuff-dishes" were also provided. All other scriptural allusions to candles likewise are held by critics to refer to oil lamps rather than to candles in the modern sense.

Candles were at first made of wax and tallow. The tallow dip is mentioned by Apuleius, a Roman writer of the second century A. D., and until modern times has been largely an article of domestic manufacture. Waxlights (L. cereus) were probably of earlier invention. Two distinct guilds of candle-makers, the "Waxchandlers" and the "Tallowchandlers," conducted the candle industry in England during the Middle Ages.

Spermaceti came into use as a substitute for tallow about 1750, while paraffine was not introduced for this purpose until about 1854. A mixture or composition of paraffine and stearine is now very generally used for candle manufacture, the proportion of stearine being greatest for candles which are intended to be burned in hot climates. Whereas the wicks of the old tallow dips required frequent trimming with a pair of snuffers to prevent unconsumed particles of the wick from choking the flame, the wick of the modern candle burns to ash and requires no snuffing; the complete combustion of the wick is further ensured by pickling it, before the candle is moulded, in a salt solution. The elimination of the snuffers was the most striking accomplishment in the history of candle manufacture. There has during recent years been considerable gain in the uniformity and accuracy of candles, due to the employment of modern machinery in moulding, as well as to the services of the industrial chemists employed by our large manufacturing concerns.

When all is said and done, however, the candle, judged by modern criterions, is monstrously inefficient. To obtain a cost comparison, we may first consider the ordinary so-called "stearine" house candles (measuring about 4 by 0.75 inches) which are sold by grocery stores at 20 cents a dozen. Three such candles tested by the writer were found to have an average weight of 28.3 grams apiece, and to have an average life of 3 hours and 35 minutes when burned in a small room free from drafts, where the temperature was about 70 degrees Fahrenheit. (In passing it may be noted that this is equivalent to a consumption of approximately 121 grains per hour, as against 120 grains per hour, the specified consumption of the old standard British spermaceti candle). The three test candles were set up on a flat surface and allowed to burn until the grease was practically all consumed; that is, until the wick "toppled over" into the grease. Thus the average life of 3 hours, 35 minutes was longer than would obtain under service conditions.

The cost of one candle-hour as indicated by the above test is found by dividing $0.05, the cost of three candles, by 10.75, the aggregate life in hours, and is found to be $0.0047, nearly half a cent per candle-hour! (These common candles give roughly one horizontal candle-power.) As one-sixteenth cent per candle-hour is now considered a high price where incandescent electric lamps are used, the extreme inefficiency of the common candle needs no further comment.

A second test having a more direct bearing on the comparative cost of wax and electricity for obtaining candle effects in churches was performed by the writer, using a fairly large yellow wax composition altar candle, the wax content of which was stated by the retailer to be about sixty-five per cent. Its diameter was one inch; length to base of cone at top, 30 inches; overall length, 30.38 inches;

[1] See *Illuminating Engineer* (N. Y.) Vol. 3, page 1.

[2] The value of the products of the candle industry in the United States in 1904, as given by the Federal Census of Manufactures, was $3,889,362. No census figures on this industry are available for previous years. The statistics for 1909 are not obtainable at the time that this is written, though it is expected that they will be issued very shortly. Basing a tentative estimate on the 1904 figures, and assuming an increase of 16 per cent per annum, the value of products in the candle industry for 1909 would be, in round numbers, $6,050,000.

weight 408.5 grains. The surface was plain and smooth, and the candle burned very evenly without dripping. Such candles, costing fifty cents apiece at retail, are sold to churches, the writer is informed, at $38.00 a hundred.

For the purposes of the test, the candle in question was marked off into three-inch sections before lighting, as shown in Fig. 1, the dividing lines being lettered from A to K inclusive. The following table gives the results of the life test:

Section of candle (each 3 ins. long)	Time of burning.	No. of times extinguished and re-lighted
A to B	3 hrs. 47 min.	1
B to C	3 hrs. 43 min.	0
C to D	3 hrs. 28 min.	0
D to E	3 hrs. 37 min.	0
E to F	3 hrs. 31 min.	1
F to G	3 hrs. 46 min.	0
G to H	3 hrs. 42 min.	1
H to I	3 hrs. 42 min.	0
I to J	3 hrs. 53 min.	1
Total	33 hrs. 09 min.	
(Average—1.23 hrs. per inch.)		
Add time from top to A	0 hrs. 20 min.	0
From J to K	4 hrs. 41 min.	0
Total life	37 hrs. 10 min. (approximately)	

The total life, 37 hours 10 minutes, gives a consumption of approximately 169 grains per hour. The operating cost for such candles, if purchased at wholesale in hundred lots, is seen to be about one cent per hour—1.02 cents, in fact, if this particular sample may be taken as an everage.

The horizontal candlepower of the test candle was measured on a precision photometer of the Engineering Department of the National Electric Lamp Association; readings varied from 1.20 to 1.26, the average being 1.23. Thus the operating cost per candlepower-hour was $0.0102÷1.23= $0.0083 (about 5/6 of a cent). From this it will be seen that the large church candles, even at the wholesale price, are more inefficient than the common house variety.

Assuming that a metal-filament incandescent lamp of 1.9 candlepower were used as a substitute for the type of church candle above described, its operating cost, including both current and renewals, would not be over one-twentieth of that of the candle. Figuring the cost of the lamp (which would probably be rated at between 10 and 12 volts, for multiple burning on the secondary circuit of a sign-lamp transformer or sign-lamp compensator) at 45 cents, its life at 2,000 hours, its total wattage consumption at 2.5, and the cost of energy at 10 cents per kilowatt-hour, the total operating cost for electricity is $0.000475, or less than one-twentieth cent per hour as against one cent per hour for wax composition.

In the preceding, the comparative cost of producing light by means of candles and incandescent electric lamps was discussed, and certain tests were cited showing the total operating cost for a 2.5-watt metal-filament incandescent lamp to be less than one-twentieth of the corresponding cost for a wax composition altar candle of the type investigated.

While the wax candle is thus so many times more expensive than the electric from an operating standpoint, there are persons who object to the use of the latter for religious purposes because, as they say, it does not give the true candle effect. Possibly flicker and flame, both of them features which one is accustomed to think of as objectionable in an illuminant—are by these persons considered advantageous in a light intended for devotional use, and whether or not this is largely a matter of education and habit, had best be left to the reader's judgment. Certain it is that the combustible candle possesses these doubtful advantages, and in addition constitutes a fire hazard which, although small, due to careful and conscientious attendance, is greatly diminished by the substitution of electricity, as is also the labor required to maintain the proper appearance and cleanliness of the candles and the fixtures.

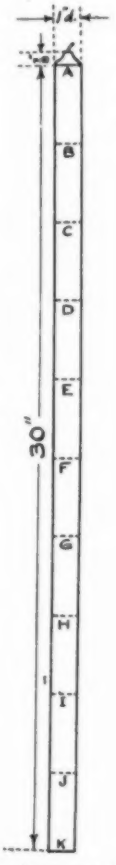


Fig. 1.—Dimensions of Test Candle.

Many types and styles of incandescent lamps suitable for candle service are regularly on the market; prominent among them are the frosted lamps with bulbs specially shaped in imitation of a candle flame. The type of lamp in question, commercially known as the the "Style D," has a carbon filament, and comes in ratings of six and eight candlepower in voltages ranging from 100 to 130. To give light intensities of more nearly the magnitude of the usual altar-candle,—that is, between one and two horizontal candlepower,—the 2.5-watt metal-filament sign lamp is perhaps the best. As a means of adapting it to the ordinary lighting circuit, the use of a low-voltage transformer is decidedly preferable to series or series-multiple wiring.

There are of course many services for which combustible candles must be used. For example, it is forbidden for a priest to say mass without at least two lighted wax candles. When a bishop or monsignor celebrates mass four candles must be used; and in the case of the Pope, seven candles are carried before him or on each side of him, in allusion to the seven golden candlesticks of Scripture.

Fig. 2.—Style "D" Lamp Bulb Designed to Represent Candle Flame.

As an example of the extensive and at the same time perfectly orthodox use of incandescent electric lamps as a substitute for "extra" church candles may be cited St. Boniface's Catholic Church, Jackson and Green streets, Louisville, Ky. A reproduction of a recent photograph showing the altar and sanctuary illumination in this edifice is shown in Fig. 3.

Each of the five altars is outlined with miniature metal-filament incandescent lamps, of which there are 406 in all. About 100 lamps are used on the "high altar." The lamps are rated at 14 volts, three candlepower, have candelabra bases, and were originally installed to burn seven in series on the commercial lighting circuit, but it has since been decided to follow the best modern practice and burn them in parallel on the secondary circuit of a low-voltage transformer. At the rated specific consumption of 1.23 watts per candle the total power consumptfon

of this miniature lighting is approximately 1.5 kilowatts.

One of the interesting features of the elaborately beautiful chancel of this church is the reproduction of Da Vinci's "Last Supper" by means of miniature statues below and in front of the altar table. The table around which the apostles are represented as seated is perfectly illuminated by three electric lamps, concealed from view. Above the table, a strong light is concentrated on the gold monstrance from lamps which are also concealed. On either side of the high altar an immense standard or "candle-stick" is located, supporting about twenty incandescent lamps. Customarily these standards would be filled with wax candles, but the new departure, far from being objectionable in any way, is thoroughly satisfactory. The same is true of the six slender "tapers", in front of each of the four side altars, incandescent lamps furnishing the light for these also.

Physiologists will perchance be tempted to inveigh against this installation, claiming that the effect produced upon the eyes by the unshaded filaments must be injurious. It might be argued in reply, that the lamps are of low candle-power, and that the glare effect is diminished by the large light-colored reflecting surfaces of the altars and by the fact that the light-sources are not located in pronounced groups with dark intervals in between, but extend entirely across the front portion of the room. More convincing perhaps than any argument from theory, is the fact that the pastor of the church, the Very Reverend Richard Wurth, and his parishioners, are emphatic in declaring their personal satisfaction with the lighting.

Fig. 3.—St. Boniface's Catholic Church, Louisville, Ky., Where Electricity is Used for Most of the Chancel and Altar Lighting.

The illuminating and electrical equipment for the above described installation at St. Boniface's, including a cabinet-concealed switchboard for the separate control of the various circuits, was installed by J. R. C. Long, Colonial lamp specialist of the James Clark, Jr., Electric Company, and current is taken from the mains of the Louisville Lighting Company.

The auditorium of St. Boniface's is illuminated by 500 forty-watt metal-filament lamps, consuming 20 kilowatts. Carbon-filament lamps were formerly used for this purpose, and there was no special decorative lighting on the altars. By the substitution of high-efficiency lamps in the main body of the church, the demand has been reduced to about one-third of its former value, notwithstanding the addition of the miniature lamps.

Churches, as a class, are short-hour consumers of electricity. This is true even of the Roman Catholic churches, although to a less extent perhaps than of most others. The fact should receive its logical recognition in the central station's lighting rate to consumers of this class by the inclusion of an adequate service charge, especially as they are coming more and more to the use of high-efficiency lamps. Any suggestions that the lighting companies may be able to prepare, showing churches how wax may be supplemented by electricity for altar and chancel lighting, whether or not the church is at present a central-station customer, will be real constructive work, serving not only to increase the immediate load but also to call the attention of clergy and parishioners to the manifold utility of electric current.

Western Association of Electrical Inspectors.

Seventh Annual Convention at Milwaukee, Wis., January 23, 24 and 25.

The seventh annual convention of the Western Association of Electrical Inspectors was held at the Plankinton Hotel, Milwaukee, January 23, 24 and 25. There were present members from seventeen states and from three Canadian provinces, the total attendance being approximately seventy-five members and guests. The initial session was opened at 10 o'clock Tuesday morning, when Victor H. Tousley, of Chicago, the president of the association, introduced Emil Seidel, who, as mayor of Milwaukee, welcomed the visitors to the city. Mayor Seidel also made some interesting comments upon the need of a municipal department of electrical inspection in Milwaukee. He said that there probably would be such a department soon, as a movement was now under way to provide for it. The address of welcome was responded to by James Bennett of Montreal, second vice-president of the association.

Following roll call, First Vice-President W. J. Canada took the chair while Mr. Tousley delivered the president's address. The speaker mentioned the humble beginnings of the organization, six years ago, and spoke of its rapid growth in prestige and usefulness. The co-operation and exchange of ideas made possible by the association had been of inestimable value to the field of electrical inspection. Members were encouraged to co-operate even more heartily, and to miss no opportunity to give fellow inspectors the benefit of personal experiences in making inspections.

Mr. Tousley called the attention of the association to the fact that the duties of the secretary's office had grown to such proportions as to make necessary the appointment of an assistant or assistants to the secretary. He spoke, too, of the wisdom of the recent change in the time of holding the annual convention to January. This change will greatly enhance the value of the work so far as it affects the National Code. The biennial meeting of the Electrical Committee of the National Fire Protection Association occurs in March. The recommendations of the Western Association of Electrical Inspectors can be presented to this committee much more effectively than would be possible if the meeting of the association were more remote in time from that of the Electrical Committee. This is especially so since four members of the association are also members of the Electrical Committee.

In his closing remarks, President Tousley emphasized the importance of the work of the electrical inspector, but uttered the caution that in the hands of inefficient or irresponsible persons, electrical inspection might become a detriment to the community. Conscientiousness and ability are prime requisites of the inspector.

After the president's address W. S. Boyd, of Chicago, secretary of the association, read the report of the Executive Committee. The report showed the membership to be 189 at present, the gain within the past year having been 13. There had been very few losses, those that did occur being due mainly to inspectors having gone into other work. At this juncture the admission of new members was taken up and a number of inspectors added to the membership list, after which the president appointed a nominating committee consisting of Dana Pierce, of the Underwriters' Laboratories, Chicago; L. A. Barley, Oklahoma City, and H. G. Young, Streator, Ill.

Technical Papers and Discussions.

The first of the papers on purely technical subjects was the report of the Committee on Underground Systems, presented by the chairman, Hugh T. Wreaks. It was explained that in the preparation of this report the committee had been aided greatly by a similar committee of the National Electric Light Association. The two committees had worked together in collecting the necessary data and Mr. Wreaks explained that some of the matter in his report had previously appeared in publications of the National Association.

It was suggested that when any underground installation is contemplated in any location, all local concerns employing electric conductors for the transmission of energy or intelligence should co-operate so as to insure the segregation of high-pressure circuits from those on which voltages are low, and also to make certain the provisions for normal expansion of the systems. Where such co-operation is impracticable, the state or the municipality may settle the matter by leasing the privilege of the control of subways to subway operating companies. The plan of municipal control is worked in some of the New Jersey towns. Here the city usually requires one mile of the lighting company's wires to be placed underground each year, half of which mile is selected by the city and the other half by the particular company interested. Mr. Wreaks thought that the state of New Jersey was working for state control of underground distributing and transmission systems.

Underground systems were classified under three heads, namely; street distribution, interior block distribution, and, finally, sidewalk distribution.

In the first of the foregoing systems of distribution, a four-duct system is usually sufficient. This allows a duct for street lighting cable, one for feeder cable, one for distribution mains, and a spare one for future growth. A cheap form of construction may be had, it was stated, by using fibre ducts incased in concrete, with manholes and distributions holes also of concrete. A system of this sort will cost, on macadam streets, from $5,400 to $5,800 per mile, allowing a 4 by 4-foot manhole every 400 feet and a 30 by 30-inch distribution hole every 200 feet. The duct should be laid 30 inches below the grade of the street and there should be two inches of concrete on all sides. The cost of service connections with such a system runs from 12 to 15 cents per foot, exclusive of pipe. The service pipe is wrought iron from manhole and distribution hole to curb line, and thence fibre duct across the sidewalk and lawn to the customer's premises.

In the interior block distribution system there are short lines of poles on property lines in the rear of lots, these being fed from underground low-tension mains. From these poles overhead services are made to neighboring buildings.

Where the sidewalk system of distribution is employed, conduit is usually laid in the grass plot between the curb and the sidewalk, and there are handholes at every other lot line, from which service pipes lead to meter boards. The duct may be either fibre or iron pipe. This system, Mr. Wreaks asserted, was only suitable for suburban sections, where the houses set well back from the property line and have no vaults extending to the curb.

After discussing briefly the relative merits of various conduit materials and making some mention of the subject of electrolysis, the report pointed out that, of the companies from which data had been secured, two out of eight companies employing alternating-current distribution ground the neutral of the primary, while the other six do not ground.

In concluding the report, Mr. Wreaks called attention to what he considered certain abuses of underground systems

in the installation of them. It was pointed out that electric or gasoline winches are necessarily used in many cases in pulling in cables and that it is often true that sufficient care is not taken to insure that the cable is not subjected to greater stress than it can safely carry. Some tentative data were presented to show what the safe strain of certain cables probably is.

The next topic considered by the association was that of "The Protection of Buildings Against Lightning," on which subject H. B. Long of Nashville, Tenn., addressed the convention. Mr. Long said that poor installations made by lightning-rod agents had tended to bring attempts to protect buildings from lightning into disrepute. Nevertheless, insurance companies recognize the value of lightning protection where the protecting apparatus is properly installed and is of the right type. He thought that stranded conductors were better than solid rods, since the conducting surface was larger. Good practice does not now insist upon the lightning rod terminating in points at the upper end, as was previously the case. In fact, the National Fire Protection Association recommends the use of three-quarter-inch iron pipe in place of rods. Mr. Long spoke also of the necessity of lightning conductors being well grounded to the metal parts of buildings on which they are installed. Dana Pierce, in discussing the subject under consideration, emphasized the necessity of thorough grounding. Lightning discharges, he said, are oscillating discharges having an enormously high frequency, which may produce powerful inductive effects in their neighborhood. Hence, if the lightning conductor is not in intimate electrical connection with the earth and with other metal in the neighborhood of the conductor, there may be disastrous side-flashes or side-strokes. An instance was recalled where such a stroke had demolished a stove in a room on the outside of the wall of which there was a lightning rod.

W. J. Canada agreed with Mr. Long's opinion that the network of overhead wires found in the denser sections of many cities reduce the lightning hazard. Damage from lightning, he said, was quite unusual in those portions of cities in which there are circuits of this sort. Speaking of side strokes, he told of a case where some miners 500 feet underground were killed by a lightning discharge.

Waldemar Michaelson, of Omaha, Neb., contended vigorously against the opinion that conductors installed for protection against lightning need not terminate in sharp points. He thought, in fact, that it was these points which afforded the protection, by permitting a silent discharge between the oppositely charged building and cloud or atmosphere. He doubted whether a metal rod or pipe was an effective conductor of lightning, his contention being that when a high-frequency flash did occur it took the shortest path to earth regardless of the presence of metal conductors.

Milwaukee Electrical Show.

At the opening of the afternoon session of the convention President Tousley introduced A. W. Collins, who, as the representative of Auditorium Association, made a short talk relative to the electrical show which is being planned to be held in Milwaukee next year. Mr. Collins explained that no effort would be spared to make this one of the largest and most representative events of the year, and asked the co-operation of the Inspectors' Association in the matter of making the show successful. It is proposed, he said, that the date of the show shall be January 13 to 18, 1913.

Adoption of New-Code Wire.

At this point in the proceedings the question of the adoption of the improved rubber-covered wire required by the 1911 edition of the National Electrical Code was taken up. In this connection Hugh T. Wreaks, of the Wire Inspection Service of the Underwriters' Laboratories, was called upon to open the discussion. Mr. Wreaks began with some remarks upon the better insulating qualities and heat-resisting properties of the new-Code wire, as compared with the wire of which previous editions of the National Code had permitted the use, and emphasized the necessity of the general adoption of the new-standard product as quickly as this general adoption may be practicable. He said that while many manufacturers of wire had been willing to discontinue making rubber-covered wire of the older type, the old-Code wire would doubtless be kept on the market as long as there was a demand for it. Manufacturers were much interested in the matter of finding out when electrical inspection boards in the various localities would stop approving old-Code wire. He considered it highly desirable, therefore, that there be a definite expression concerning the matter on the part of the Western Association of Electrical Inspectors.

Ben W. Clark, of Detroit, followed Mr. Wreaks' discussion with some remarks upon the difficulty which he thought assistant inspectors might experience for a while in distinguishing the old wire from the new. He said that the department of municipal electrical inspection in Detroit, of which he is in charge, had stopped approving old-Code wire of the smaller sizes already, and that approval would be discontinued on all sizes after July 1, 1912. Mr. Wreaks assured Mr. Clark, however, that an inspector familiar with the distinctive markings of the wires put on the market by the different manufacturers would find it easy to distinguish the new product from the old. Being questioned here as to prices, Mr. Wreaks stated the new wire would probably not be very different in price from the old.

James Bennett, of Montreal, explained that his department in Canada had decided to approve old-Code wire until January 1, 1913. He said further that Canadian inspectors thought at first that the 1911 specifications were too exacting. They had become convinced of the error of this opinion now, however, and had no anxiety in the matter further than the fear that United States manufacturers might possibly use Canada as a market for surplus accumulations of the old wire.

F. G. Dustin, of Minneapolis, said that he had notified contractors in his territory that old-Code wire would not be approved after July 1, 1912. He thought they would be able to dispose of the old stock by that date. He issued this notice on January 15. He thought this was a matter which should be handled promptly.

It was stated that in Winnipeg, Canada, old-Code wire would not be approved after July 1, of the current year. After a further discussion of the subject by W. J. Canada and James Fenton, Waldemar Michaelson moved that the Western Association of Electrical Inspectors go on record as recommending that all affiliated inspection departments which have not already taken action in the matter discontinue the approval of old-Code rubber-covered wire in sizes up to and including No. 1 B and S, gauge on April 15, 1912, and that the approval of all larger sizes be discontinued on July 1. At the suggestion of James Bennett, indorsed by Dana Pierce, flexible cord and fixture wire were not included. The motion passed, and Secretary Boyd was instructed to notify wire manufacturers of the action of the association.

Improvement in Methods of Making Electrical Inspections.

When this part of the program was reached, printed sheets on which various questions to be discussed appeared were distributed among the inspectors present. These questions covered such topics as the best means of determining whether a given job of wiring complies fully with Code requirements; plans for making sure that material used has been approved by the Underwriters' Laboratories; methods of increasing the number of inspections that can be made in a day; better ways of

approaching owners of property in which there is defective wiring; improvements in inspection blanks and records; measurement of insulation resistance; and the inspection of the electrical equipment of traveling theatrical companies.

These subjects were discussed in considerable detail, and many points of value in inspection practice brought out. During the discussion Ben W. Clark, of Detroit, explained in detail the inspection methods in vogue in his city. He pointed out that the central station was permitted to connect to the service before the final inspection had been made, thus making it easy to carry out a preliminary testing of all circuits. After this preliminary test, the blades of the service switch are short-circuited with a seal to which is attached a card stating that the installation must not be used until final inspection has been made, which final inspection follows the completion of the installation of fixtures. Mr. Clark spoke also of the gain in inspection work made possible by the use of motor cycles and telephones by assistant inspectors. Each of his assistants is required to report to the office at frequent intervals by means of telephone. James Bennett and James Fenton reported methods somewhat similar to those described by Mr. Clark, as did also Mr. Taylor, City Electrician of Dallas, Texas. Mr. Taylor emphasized especially the advantage of using motor cycles in making electrical inspections.

At this point V. H. Tousley explained his method of training new inspectors. He said, further, that he expected to adopt the plan of having one of the older and more experienced of the men in his department make a brief final inspection of installations as they were reported satisfactory. Relative to this subject, James Fenton remarked that he had found it good practice to change the territory of assistant inspectors frequently. In connection with the electrical work at the St. Louis Exposition, a few years ago, he had found this plan especially effective. Continuing his remarks, Mr. Tousley deplored the prevalence of the use, in Chicago, of fittings and materials which have not been approved by the Underwriters' Laboratories. But F. G. Waldenfels, of Chicago, thought the use of unapproved materials was not nearly so common as Mr. Tousley had argued.

H. B. Long, whose work as an inspector for insurance interests in Tennessee includes widely scattered small towns, was called upon to discuss methods of handling work in small towns. He said that when defective wiring had been discovered the property owner was notified of the defects from headquarters and warned that his insurance rates would be increased unless the existing defects were promptly remedied. Attached to the letter of notification was blank to be filled out by the contractor who repaired the wiring. If this blank was returned properly filled in due time, the property owner was notified that his rates would not be raised unless a subsequent inspection, which would soon be made, showed that the repairs had not been done properly.

The subject of insulation tests on interior wiring elicited considerable discussion. Hugh T. Wreaks thought that specifications for making insulation tests on wiring should indicate the length of the conductor. Mr. Wreaks was instructed to make recommendations to the Code Committee of the association on this matter.

Visit to Allis-Chalmers Works.

Wednesday, the second day of the convention, was spent at the West Allis plant of the Allis-Chalmers Company. During the forenoon, the association was shown through the works of this company and various interesting and instructive manufacturing processes and tests were explained to the visitors. At the conclusion of this inspection of the shops and testing departments, the Allis-Chalmers Company entertained the visitors at an informal luncheon in the company's club rooms, after which there were a number of short lectures in an assembly hall in the same building. The speakers here were C. E. Lord, patent attorney for the Allis-Chalmers Company; and Louis Strathmore, R. B. Williamson, and H. W. Cheney, all likewise of the Allis-Chalmers Company, and W. G. Middleton, of Robert W. Hunt & Company, Chicago.

Mr. Lord spoke generally of inventions and patents, and enumerated patents held by various electrical manufacturing companies. He recognized the great value of the work of the electrical inspector, but thought that inspectors sometimes made the mistake of condemning apparatus on the sole ground that it was not considered standard, without looking very carefully into its actual merits. He was followed by Mr. Williamson, who made an instructive talk on the induction motor, his remarks being illustrated with lantern slides.

Following Mr. Williamson, Mr. Strathmore spoke of high pressure pumping systems for fire-protection service. He showed lantern-slide illustrations of such installations in New York City, Baltimore and Philadelphia. The New York plants, of which there are two, consist essentially of rotary pumps driven by induction motors. A pressure of three hundred pounds or more in the mains is available. There is a by-pass around the pump from the discharge to the suction line, and a valve in this is kept adjusted while the pump is in service so as to regulate the discharge to the number of streams the firemen are using. In an emergency a water pressure of three hundred pounds to the square inch can be supplied all over the New York system within a minute and a half after the alarm reaches one of the pumping stations. Motors having wound rotors are employed in driving the pumps. In the high-pressure system at Philadelphia, pumps are operated by gas engines, while in Baltimore steam engines are employed. In this latter plant the boilers are always kept warm; when the plant must be started, steam is supplied from a neighboring source until the boilers can be cut in.

H. W. Cheney delivered an illustrated lecture on starting devices for electric motors. His remarks were confined mainly to alternating-current apparatus. He described in detail various types of starters for squirrel-cage induction motors and also resistance starters for machines having phase-wound rotors or secondaries.

"Electrolysis" was the subject of a paper by W. G. Middleton, who described at considerable length tests which have been conducted relative to electrolytic action on the re-inforcing steel in re-inforced concrete buildings, and also spoke of the deductions of various authorities on electrolytic action.

The session was closed by an appropriate talk from Waldemar Michaelson, of Omaha, who made some well-chosen remarks concerning the courtesies extended the association by the Allis-Chalmers Company.

Visit to the Cutler-Hammer Company's Factory.

The third and final day of the convention began with a visit to the plant of the Cutler-Hammer Manufacturing Company. Here, under the direction of R. H. Mansfield, secretary of the Cutler-Hammer Manufacturing Company, visitors were shown every possible courtesy.

An interesting feature of the tour of inspection through the shops of the company was a series of tests run for the benefit of the visitors on various types of resistance units, starters and speed controllers for electric motors. In a number of cases excessive current was purposely held on the unit under test until it burned out, the object being to show that in every case the resistance conductor would burn out and thus open the circuit before neighboring objects were exposed to temperature high enough to make ignition probable.

Completion of Technical Program.

The closing session of the convention was devoted mainly to a consideration of motor-driven motion picture apparatus, the grounding of secondaries and the use of nails in the installation of knobs and cleats in inside wiring. Incidentally the question of the inspection of the portable electrical apparatus used by theatrical troupes, the discussion of which had been postponed from a preceding session, was given some attention, and there was also a short talk from Franklin H. Wentworth, secretary of the National Fire Protection Association.

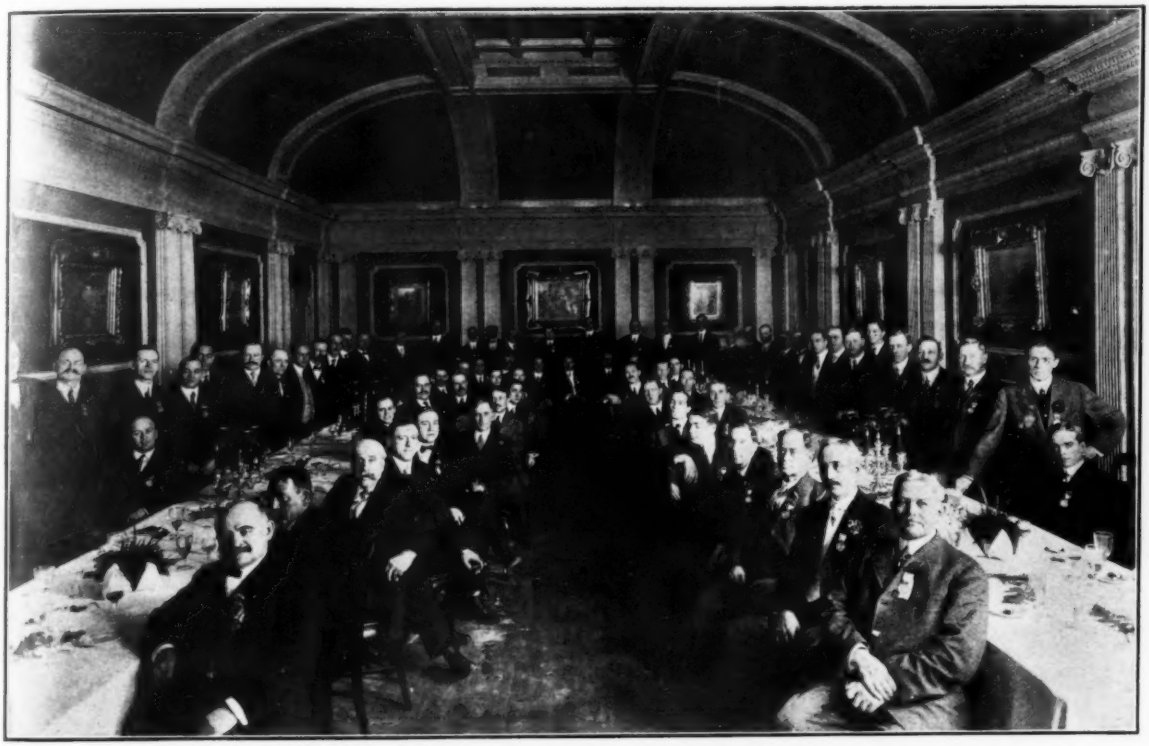
The discussion of motion-picture machines was led by James Bennett and Leon Taylor. Mr. Bennett argued that there is a motor-driven machine in use which is safe and which inspectors are approving not only in Canada but in the United States as well. Mr. Taylor, on the other hand, insisted that it was objectionable because it permitted the operator to turn his attention to something else while the machine was running. He related an incident in which there were two of these machines in one booth; as the film was about to run out on one of them the operator attempted to start the other so that there might not be any interruption in the sequence of the pistures on the screen; the carbons on the first machine dropped together and stuck, with the result that the conduit was fused and a fire started. After further discussion, however, a motion passed to recommend the approval of such machines as might pass the inspection of the Underwriters' Laboratories.

The use of nails in securing porcelain knobs and cleats to surfaces wired over was next considered, and the subject brought out quite a lengthy discussion. Some of the inspectors present had found that wiremen frequently break the knobs in driving the nails, while others stated that in an effort to avoid breaking the knobs electricians often left nails projecting so far that the wires fell out of the grooves. Still others had found nails more desirable than screws, the reason being, in most cases, that when screws are used wiremen often drive them into the wood most of the way, giving them only two or three turns with a screw-driver, and thus leaving them in such a condition that they soon allow the knobs to fall away from the wood. At any rate, a motion to recommend the use of screws instead of nails, and leather washers was passed.

Inspectors from various localities took part in the discussion of the proper inspection of the portable electrical apparatus of traveling theatrical companies. Leon Taylor said that in Dallas, Texas, the electricians of local theaters were required to give bonds of a thousand dollars each, and that these electricians were responsible for the equipment used in their respective theaters. Ben W. Clark explained that in Detroit the local inspectors examined the electrical appliances of each company coming to the city, and that this procedure had been found effective and satisfactory. The discussion indicated that this same plan was employed in many of the cities.

W. J. Canada was on the program for a paper on the grounding of secondary circuits, but due to a lack of time at his disposal was only able to make a few remarks on the subject. He said that companies which had adopted the grounding of secondaries had been pleased with the results, so far as he had been able to get the facts, and he also enumerated the different methods of making the ground connection. Answering a question from Mr. Tousley, he stated that he did not consider grounding the conduit to the neutral of the grounded secondary system an effective ground for conduit.

Because of the fact that the time for the convention had been practically consumed and of the further fact that he had to catch a train for another appointment, Franklin H. Wentworth, of the National Fire Protection Association, was only able to make a talk of a few minutes' duration. Mr. Wentworth spoke pointedly of the fire waste in the United States, and showed



Banquet at Convention of Western Association of Electrical Inspectors.

that this waste was much greater per capita of population than in some of the older countries. He said that Americans had built largely of wood and that affluence had been conducive to carelessness in the matter of fire protection. The idea of conservation is gaining ground, however. He gave some account of his own experiences as a pioneer electrical inspector, stating that he owed Secretary Boyd, of the Western Association of Electrical Inspectors, a debt of gratitude for first engaging his interest in this work.

The convention tendered Mr. Wentworth a vote of thanks for his remarks.

Social Features of the Convention.

On Tuesday evening of the convention those in attendance were tendered a banquet at the Republican House. There was a well selected menu, during and after the serving of which the guests were favored with a number of appropriate toasts. H. E. Bloomer acted as host and William S. Boyd was toastmaster. Those responding to toasts were: Waldemar Michaelson, F. C. Dustin, H. B. Long, James Bennett, Loyd Durand, W. J. Canada, J. S. Mahan, R. J. Swain, L. A. Barley, H. E. Bloomer, G. A. Taylor, Fred Steel, Hugh T. Wreaks and James Fenton.

The luncheon served by the Allis-Chalmers Company has been mentioned already. Further entertainment features were a theater party on Wednesday evening and luncheon by the Papst Brewery Company on Thursday.

Election of Officers.

The following officers were elected for the current year:

President, W. J. Canada, engineer Rocky Mountain Fire Underwriters' Association, Denver, Col.

First vice-president, Ben W. Clark, chief electrical inspector, Detroit, Michigan.

Second vice-president, H. M. Maxwell, Dayton, Ohio.

Secretary-treasurer, William S. Boyd, Chicago, Ill.

Executive Committee: James Bennett, Victor H. Tousley, W. B. Hubbell, E. Anderson, Hugh T. Wreaks and H. G. Young.

Exhibits of Manufacturers and Supply Men.

While the display of electrical supplies at the convention was not particularly elaborate there were complete and representative lines of wiring supplies and other such apparatus as the inspector is especially interested in, tastefully displayed in rooms adjacent to the convention hall. The firms represented were: The Perkins Electric Company, the Crouse-Hinds Company, Fairbanks, Morse & Company, the General Electric Company, the Cutler-Hammer Company and the Central Electric Company, of Chicago.

Next Convention.

The next annual convention of the Western Association of Electrical Inspectors will be held at St. Louis, January 27 to 30, 1913. These conventions having grown steadily in attendance and enthusiasm during the past six years, it is expected that the St. Louis meeting will even surpass the one which has just closed at Milwaukee.

Annual Convention of the Northwestern Cedarmen's Association.

The annual convention of the Northwestern Cedarmen's Association was held at the West Hotel, Minneapolis, Minn. January 23 and 24. Action was taken looking to the enlargement of the organization, and a department for handling ties and pulp wood was arranged for. A membership committee was appointed to look after the extension work which is to be undertaken this year.

In his presidential address T. M. Partridge of Minneapolis, reviewed the work of the Association, giving particular emphasis to the matter of fire insurance, the prevention of forest fires, the workingman's compensation act, flat-car equipment and the substitution of tonnage. He said that confidence was the keynote of all expressed opinion of the big factors in the business, and that altogether conditions looked favorable for business during 1912.

Thomas P. Bradley.

The secretary's report was presented by H. H. McKinney, who stated that the Associated started the year 1912 with practically the same amount of stock on hand as January 1, 1911. L. L. Hill, of the Page & Hill Company, Minneapolis, delivered the report of the Committee on Insurance Legislation.

The Cedarmen's banquet closed the first day's session. This was greatly enjoyed by everyone present. Among those in attendance were the following: H. M. Dixon, Cloquet, Minn., Cloquet Tie and Post Co.; Milton H. Schussler, Minneapolis, Coolidge-Schussler Co.; W. S. Patch and H. Worth, Menominee, Mich., Crawford Cedar Co.; T. P. Bradley, Duluth, Minn., Duluth Log Co.; M. K. Bissell, Escanaba, Mich., Erickson & Bissell; M. Sperry, Milwaukee, Wis., and Escanaba, Mich., MacGills & Gibbs Co.; W. C. Moss, Minneapolis, McCulloch & Moss Lumber Co.; Joseph Meloney, Spooner, Minn., Meloney Bros.; A. T. Naugle, Chicago, Ill., Naugle Pole & Tie Co.; H. W. Reade and A. D. McIntyre, Escanaba, Mich., National Pole Co.; T. M. Partridge & H. F. Partride, Minneapolis, T. M. Partridge Lumber Co.; L. A. Page, Jr., and L. L. Hill, Minneapolis, Page & Hill Co.; E. L. Clark and L. A. Furlong, Minneapolis, Valentine-Clark Co.; P. H. Knolk, Hermansville, Mich., Wisconsin Land & Lumber Co., and W. B. Thomas, Manistique, Mich., White Marbe Lime Co.

On Wednesday the following officers were elected: President, T. P. Bradley, Duluth; vice-president, W. C. Moss, Minneapolis; treasurer, W. B. Thomas, Manistique, Mich. M. K. Bissel was elected to succeed E. L. Clark, and L. A. Page was elected to succeed himself on the Board of Directors.

Thomas P. Bradley, the new president of the Association, is one of the most popular and successful men in the lumber industry. His grandfather and father were lumbermen, and his two younger brothers are now associated with him in the Duluth Log Company and the Bradley Timber & Railway Supply Company. Mr. Bradley has been hard at work in the lumber business for over sixteen years, and he is secretary and general manager of the two companies he is associated with.

New York Jovians Will Hold Big Rejuvenation.

The New York Jovian Lunch Club is perfecting arrangements to hold a rejuvenation on an elaborate scale at the Hotel Astor, New York, February 7. The rejuvenation will be held at 9:00 p. m., to be preceded at 7:00 p. m. by a dinner. The dinner will be held in the Belvedere room, where over 400 guests can be accommodated. Robert L. Jaynes, Reigning Jupiter, and a number of other prominent Jovians from various sections of the country, will be in attendance. F. E. Watts, Statesman for New York, is in charge.

At the meeting of the New York Jovian Lunch Club on January 24, Jeremiah W. Jenks, LL. D., professor of political economy and politics, Cornell University, entertained the club with a most interesting discussion of the economic aspect of the recent trust decisions. As usual, the meeting was very well attended, every seat being taken.

New Electrical and Mechanical Appliances

E. C. & M. Motor-Field Rheostats.

The Electric Controller & Manufacturing Company, Cleveland, O., has recently placed on the market a new line of motor-field rheostats for varying the speed of adjustable-speed, shunt and compound direct-current motors. The manufacturers claim the following features of design to be of important value: The construction is fireproof throughout; the face carrying the arms and contacts is of the best quality Monson slate with beveled edges and oil finish; the resistance units consist of small cast-iron grids insulated with asbestos and wound with resistance wire, these units being carried by the slate and fastened directly to the contacts; the resistance wire has an unusually low temperature coefficient so that the resistance of the rheostat, for any one setting, does not increase with heating and thereby alter the speed of the motor which it regulates; an ornamental dial plate carrying the words "Fast" and "Slow" indicates at a glance which way to turn the rheostat handle to obtain the desired change in motor speed; by removing the four corner bolts, the slate carrying the resistance, contacts and arm can be readily removed from the case; any one resistance unit may be removed and replaced without disturbing adjacent ones.

An extremely interesting and valuable adjunct to these rheostats is what has been designated the field-rheostat relay. It is well known that a shunt or compound wound motor should be started from rest with full field strength and, in fact, if the shunt field is weakened to a large extent, it may be impossible to accelerate the motor, because of insufficient torque, prohibitive sparking at the commutator, or such a large volume of current that fuses and circuit-breakers would be opened. It has, therefore, become the preferred practice to return the rheostat handle to position of full field strength whenever the motor is started.

The field-rheostat relay has been developed to prevent starting the motor with a weakened field.

This relay consists of a magnet coil or solenoid through which passes a steel plunger carrying at its lower end a contact plate, for electrically connecting two contact studs. The magnet coil and the plunger are enclosed in an iron case which serves not only for protection, but acts as a part of the magnetic circuit.

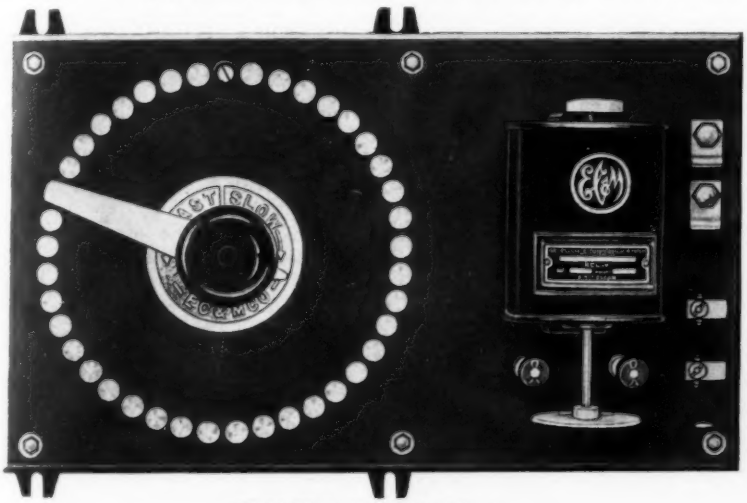
The relay coil is connected in series with the armature circuit of the motor, and the two contact studs are connected to the terminals of the motor-field rheostat so that the rheostatic resistance is short-circuited when the contact studs are bridged by the contact plate.

The relay coil is so designed that when the armature current exceeds a predetermined maximum the plunger is drawn up, causing the contact plate to connect the two contact studs, thus cutting out all of the resistance in series with the shunt field. This gives the motor its full field strength and consequently maximum torque, enabling it to properly accelerate its load. As the current decreases, due to the speeding up of the motor, the relay plunger drops, inserting the rheostatic resistance in the shunt-field circuit and weakening the field. This cycle of operation is repeated until the motor has been safely brought to the proper speed as determined by the setting of the motor-field rheostat.

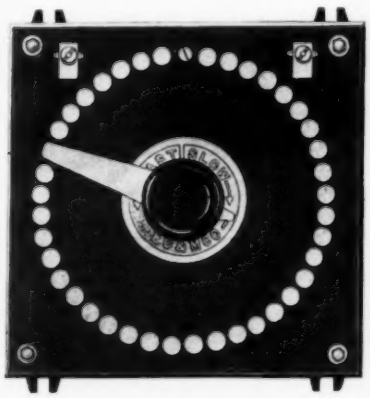
The E. C. & M. field-rheostat relay makes the starting of adjustable-speed, shunt and compound-wound motors absolutely safe, no matter what the setting of the motor-field rheostat may be. It permits of setting the field rheostat to give the most efficient motor speed for the work in hand and no matter how often the motor is started and stopped, it will invariably run at this efficient speed. It saves the time of the operator, who no longer has to adjust his motor-field rheostat after the motor is safely started.

When this relay is used in connection with the E. C. & M. automatic motor starter or controller, the motor cannot be injured during acceleration.

The E. C. & M. motor-field rheostat is furnished either with or without field-rheostat relay. It is rated up to and including 50 horsepower, at 110, 220 and 550 volts, and provides a maximum speed variation of 4 to 1.



Field Rheostat with Relay.



Motor Field Rheostat.

Michigan Casings for Underground Steam Pipes.

The sale of steam from a central station for heat or power purposes is a comparatively recent conception. The first plant was built at Lockport, N. Y., in 1877. From that time on the distribution of live and exhaust steam has grown more popular each year.

The exhaust-steam system is possibly used more extensively. This plan enables the operator to utilize the steam which was heretofore wasted in the air or sewer, thereby benefiting his plant also in a mechanical way. In this way one may operate with little added power a water, electric-lighting and steam-heating plant from the same power house.

Where a system of this kind has ever been attempted with good practical management the operator has been invariably successful.

The most important factor in the economical distribution of steam through long lines of underground pipes is the percentage of loss in proportion to the distance of the point of delivery from the supply station. Upon the reduction of this loss to a minimum depends the practicability of the undertaking.

Forty years ago the Michigan Pipe Company, of Bay City, Mich., took this matter in hand and put on the market a tin-lined wood covering for underground steam pipes which was found to be nearly a perfect insulator, reducing heat loss and condensation to from one-quarter to three-quarters of one per cent to one mile of pipe delivering at capacity. Improvements have been made on this casing with reference to its ability to withstand all attack from the outside until it is now a simple and durable material, and one which is used by the largest central-station steam companies in the country.

Michigan Wood Casing for Steam Pipes.

Michigan steam-pipe casings are used for insulating underground steam pipes for either exhaust or live-steam heating systems. In manufacturing the wood casing there have been brought together materials which are most effectual in warding off the natural enemies of steam pipes of this nature. The casings are manufactured of thoroughly seasoned wood, either white pine or tamarack, both solid and in the built-up form. The casings are made in lengths up to eight feet and strengthened with a No. 6 double galvanized steel wire. The outer and inner surfaces of the casing conform exactly to the size of the pipe desired. The sides of the staves used in the manufacture of the built-up pipe are furnished with tongue and groove running the entire length. The interior of the casing is lined with a layer of bright tin. The outside of the casing is coated with a heavy asphaltum coating and the pipe is rolled in a fine sawdust while the coating is still hot, giving the same a protection against rough usage en route. The mortise and tenon ends of the casing are treated with a special creosote preparation.

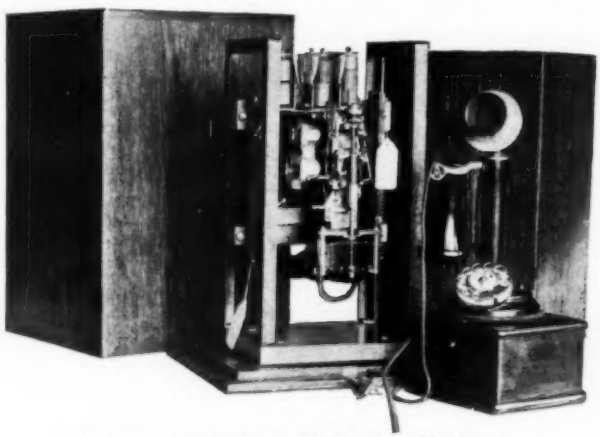
Wooden casings have been proven superior to casings of any other manufacture, excepting the expensive concrete tunnel construction, and even this has been condemned by some steam engineers. The wood is a non-conductor of heat and cold. The tin lining has reflecting powers in concentrating the radiant heat at the wrought-iron pipe. Moreover, a dead-air space is allowed of from 2 to 3.5 inches. This space also allows for placing of pipe guides, or rests, in the line. The outer coating of asphaltum protects the outer surface of the pipe from the effects of dampness or drainage. The joint is so formed that it is absolutely waterproof.

The construction of the casings is simple. The materials themselves are extremely durable, having been known to last for thirty years of constant use, and the method of installation requires no skilled labor, as the sections are merely driven together, forming a driving fit, the mortise and tenon joints fitting snugly together.

The company manufactures these materials from timber lumbered and manufactured by it, and only the best of the cut is used for this purpose. The seasoning is done by its own men and each piece which goes to make up the casings is inspected a number of times before the pipe is allowed to leave the factory.

The Automatic Telephone Monitoring System.

During the past few years many of the large telephone operating companies have sought some device for monitoring all operators from one point. For several of these companies apparatus has been designed to fill this need, and in those exchanges where it has been installed it has given very satisfactory service and proved itself invaluable to the manager.



Automatic Telephone Monitoring Equipment.

With this system it is only necessary for the manager to turn the dial of his telephone to call into the circuit of any operator in his exchange. If a man has ten exchanges in the city it is only necessary for him to turn the number on the dial which has been assigned to the exchange to get into communication with that exchange, and then to turn the number which has been assigned to the operator, to get into that operator's circuit.

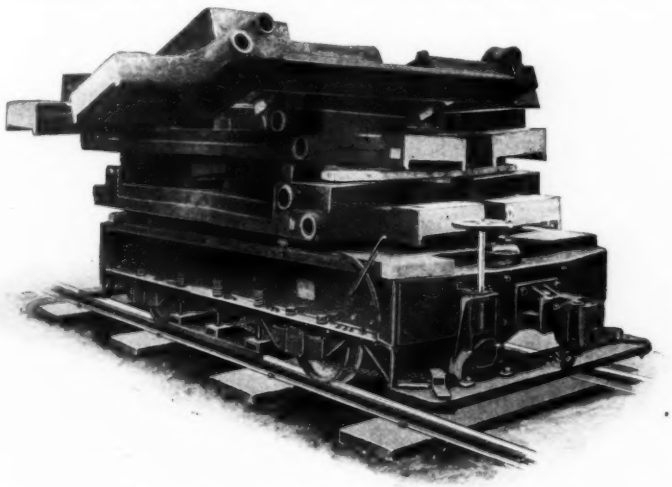
The connections are made absolutely noiselessly and secretly, so that there is no chance of the operator being warned of supervision. If he desires, the manager can talk to the operator by merely pressing a small button, which is supplied with each set.

With this system the manager can personally supervise every operator in his service from his own desk at his office, or from his own home, or from any other place he desires. With the calling system in his own home he can monitor the service on Sundays, holidays and evenings, at times when the service is usually worst. He can monitor from his office during the day and thus do away with the necessity of

visiting the various exchanges and monitoring them from the chief operator's desk. Monitoring from the chief operator's desk is unsatisfactory because it necessitated that person's presence in the room in most cases. Her entrance puts every operator on her guard, and consequently for the moment improves the service.

The cost of this system is only nominal, as it consists of very simple parts which are easily installed, and which, once installed, need no further attention. All the parts are adjusted before leaving the factory.

The system was perfected by the Automatic Electric Company, of Chicago, to fill a very evident need of the manual operating companies. Such a system once installed will do more to improve manual service and to decrease the cost of operating than any one device heretofore marketed. It has passed the experimental stage, as is shown by the satisfaction expressed by those companies which have already put it into service.



Storage-Battery Locomotive With Load.

General Electric Storage-Battery Locomotives.

The success of the storage-battery equipment for electric vehicles has been so marked that it has been applied to electric cars, electric locomotives, etc. The storage-battery locomotive is designed for service where a trolley system can not be installed or is not desirable, and finds applications especially in short-distance hauls at low speeds, such as over the industrial track in and about factory buildings, or where the conditions would require changing the trolley continually, as in contractors' service. These locomotives may be built to carry their loads on the platform or to haul trailing loads.

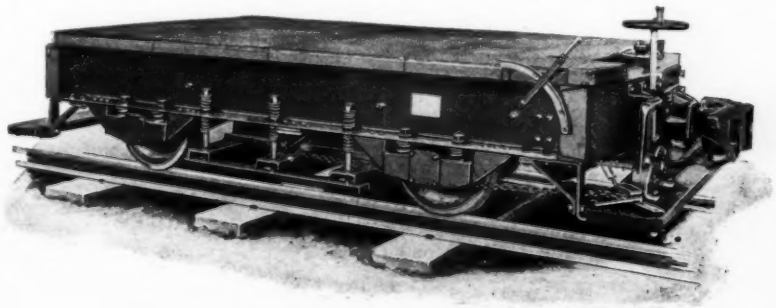
The General Electric Company is now placing a storage-battery locomotive on the market. The mechanical design is in accordance with the most approved and up-to-date practice. The frame consists of two steel I-beam sides and two steel channel ends, carefully fitted at the joints and held rigidly together with steel angles and heavy bolts. The end frames are faced with wood bumpers to which suitable coupling devices are attached, these latter being designed to suit the customer's cars. The cast-steel pedestal jaws which carry the journal boxes are bolted to the lower web of the side frames. The cast-steel journal boxes are of special design and are fitted with roller bearings which insure efficient mechanical transmission of power and therefore economy of battery current. The weight of the car is supported from the journal boxes by two heavy coiled springs.

Brake tension is effected by the screw and nut principle, the brake spindle having a square thread on which travels a nut that carries an equalizing bar attached to the brake lever system. This furnishes a very efficient method of braking, as a slight exertion only on the part of the operator is required and the brakes are automatically locked in any position without the use of pawls or rachets.

The motors used are of the automobile type designed to operate from batteries and have characteristics that secure the maximum possible economy in the use of battery current. They have high efficiency, large overload capacity and practically sparkless commutation. The high efficiency is obtained by designing them with a small air gap and running the iron at low densities. Furthermore, on account of the low densities the speed and torque characteristics are steeper than in the case of the ordinary series motors, a feature which tends to reduce the overload which can be thrown on the battery. The armature shaft rotates in ball bearings and consequently the friction losses are very light and the wear of the bearing is practically negligible. The motors are very compactly designed, yet they are readily accessible for inspection and repairs. They are also dust and moisture proof and are mounted in a cast-steel suspension cradle, one side of which is supported on bearings on the axle while the other side is spring-suspended from the locomotive frame, this manner of suspension being equivalent to standard railway practice.

The motor drives the axle through double-reduction gearing, an intermediate shaft, supported in the bearing housing and cast integral with the suspension cradle, carrying the intermediate gearing. As the service required of a storage-battery locomotive is ordinarily performed at low speed, the use of the double-reduction gearing permits slow speeds to be obtained without any rheostat losses. Due to the large gear reduction from armature shaft to wheel tread, very high tractive efforts are obtained at comparatively small current inputs to the motor. When drawing light loads these locomotives have speeds of from 4 to 5 miles per hours, while with heavy loads the speed is 2 to 2.5 miles per hour.

The storage batteries are especially designed for the service, being very rugged in construction and due to the use of specially constructed plates have high ampere-hour efficiency. The battery cells are grouped in four or more trays and are mounted in an angle-iron crate, which is spring-suspended from the frame.



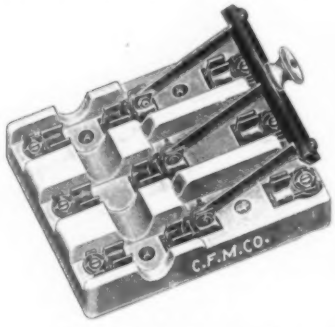
Storage-Battery Locomotive Stripped for Service.

Union Combination Switches and Cutouts.

With the recent ruling of the Underwriters against the use of the mica plug fuses on 250-volt circuits, there has been need for a compact unit serving both as switch and cutout for motor work and for entrance service cutouts. The old-style slate-base switch with fuse extensions having so much exposed metal has gradually come into disfavor in preference for a procelain combination switch and cutout, in which the parts of opposite polarity are protected from acidental short-circuits, particularly in machine shops, etc.

The Chicago Fuse Manufacturing Company has recently put on the market a line of combination switch and cartridge-fuse cutouts ranging from three to sixty amperes in capacity for 250-volt circuits. These fittings are an extension of the "Union" line of porcelain cutouts, having the same general features of design. They are as compact as permissible by the Underwriters' specifications for switch spacings and have porcelain barriers between the metal parts of opposite polarity.

The illustration herewith shows the new compact, triple-pole block arranged for wires entering at the bottom when mounted in the upright position. The fuses protect the device itself and the switch tends to fall down when not in use, thus complying with the suggestions of the Underwriters for the proper installation of knife switches. These switches are also furnished for wires entering at the top.



Union Switch and Cutout.

The bases of these fittings are sufficiently thick to allow one-inch spacing for knob and tube work, and where used in basements or other damp places. The cross-bars are of heavy fiber, having the knife blades mortised into them and securely attached by a screw. The clips are punch-formed and made of copper with liberal thickness to insure a lasting spring contact and cool operation under continuous load. The hinge contacts are formed in strict acordance with the Underwriters' specifications. The aim in design throughout has been to make a more rugged and serviceable switch and cutout than those commonly met with on the market.

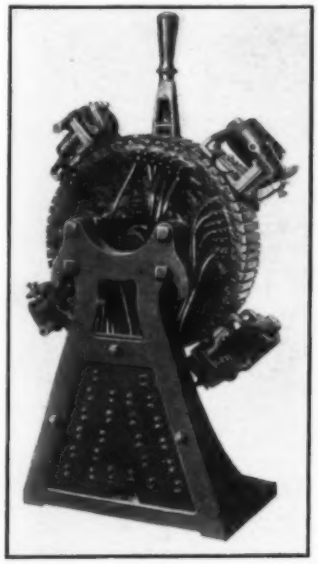
A New Crane Controller.

The well known "grindstone" type of controller used extensively in connection with direct-current motors operating cranes, hoists, steel-mill machinery, etc., has proven eminently satisfactory. It has recently undergone a refinement, however, which will still further increase its value by simplifying its construction and increasing its durability.

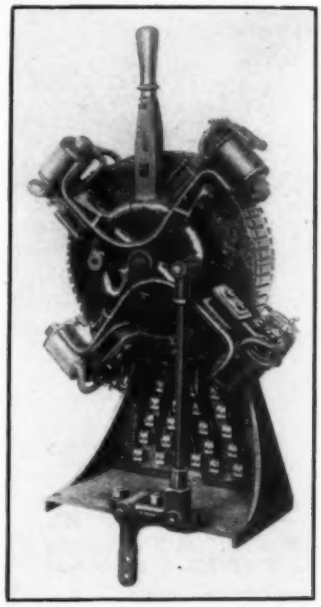
As shown in the illustrations, the controller consists essentially of a cast-iron frame on which is mounted a stationary disk carrying the contact pieces and cross connections. Pivoted to the center of the disk is the switch arm with four brush-holders. The resistors can either be mounted on the frame or separately.

As a result of a series of experiments, the Westinghouse Electric & Manufacturing Company has recently placed on the market controllers of this type in which the disk is made of concrete instead of stone. By a special treatment, the concrete disk is made a thorough nonconductor and at the same time moisture resisting. The use of concrete permits the cross connections between the segments to be made within the body of the disk, thereby giving the latter a reinforced concrete construction and at the same time producing a more compact piece of apparatus. The concrete disk with its self-contained cross connections also gives the controller a neater appearance than the older type.

In this particular piece of apparatus the resistors are separate and not shown. The contact pieces are attached to the disk by screws and are renewable.



Westinghouse Crane Controller.



Reverse Side of Controller.

The 1911 Returns Make Western Electric Largest Electric Manufacturing Company in the World.

Western Electric's year, ended December last, shows a total of $67,000,000 in goods billed out, or about six per cent greater than the corresponding twelve month in 1910, and ranks as the second largest the company has experienced, totals for the last twelve years being as herewith shown.

Year	Gross Sales	Increase	Per cent.
1911	*$67,000,000	$ 4,000,000	6
1910	†63,000,000	17,000,000	36
1909	46,000,000	14,000,000	44
1908	32,000,000	‡19,000,000	‡39
1907	53,000,000	‡16,000,000	‡23
1906	69,000,000	25,000,000	56
1905	44,000,000	12,000,000	37
1904	32,000,000	2,000,000	6
1903	30,000,000	1,000,000	3
1902	29,000,000	5,000,000	20
1901	24,000,000	.....	..
1900	24,000,000	.....	..

*Round figures. †12-13ths. ‡Decrease.

If the 1911 gross business of the Western, says the *Wall Street Journal*, proves to be somewhat larger than that of the General Electric, the former will have advanced to the position of the largest manufacturer of electrical apparatus in the world. Next in order is the Westinghouse Electric & Manufacturing Company, which is expected to show gross sales of about $30,000,000 for last year, while abroad there are only two companies, the Allgemeine Elektricitäts Gesellschaft and the Siemens-Halske companies of Germany which compare at all with American companies. The two foreign companies occupy somewhat the same position abroad as the Westinghouse and General Electric here.

Western Electric Company has now nearly recovered all the ground that it lost after 1906, with this difference, that the 1906 great total was due to an un-

usual expansion of the telephone industry while last year's business was the result of a normal demand. Further, the business last year was transacted in smaller units than in 1906 and hence with a considerably larger number of customers.

Increased cost of labor and material, while the prices of manufactured articles have not advanced, have cut down the Western Electric's margin of profits in common with many industrials. The situation has been largely met by introducing operating economies and scientific management of manufacturing operations. Probably few industrial companies have gone further into the theory and practice of scientific management than the Western Electric. At the Hawthorne plant, where the manufacturing end of the business is centered, there is a corps of "efficiency engineers" whose entire business is to make studies and experiments looking towards an improvement of present methods.

At the close of the year there were about 24,000 persons on the pay rolls, of which about 12,000 were at the Chicago plants, the others being distributed in the factories in New York, through the thirty houses in the United States, and the factories abroad.

Western Electric's business in Chicago and the Middle West suffered less last year than in the East, where most of depression talk has come from. A business for this year as large as last is expected with some lines showing increases. At Hawthorne new buildings have been erected which will be occupied by the end of this year and the work of concentrating the manufacturing at that point will be continued.

Electrical Vehicles and Accessories at Chicago Automobile Show.

Several new makes of electric vehicles and many new electrical accessories are being shown at the twelfth annual automobile show which is being held in the Coliseum and First Regiment Armory, Chicago, Ill. The show opened on January 27 and will continue until February 10, the first week being devoted to pleasure cars and the second week to commercial cars.

Among the exhibits, the following are of interest from the electrical standpoint:

Anderson Electric Car Company, Detroit, Mich., exhibited three four-passenger broughams, and a new model five-passenger limousine.

Baker Motor Vehicle Company, Cleveland, O., exhibited two coupes, two four-passenger broughams and a runabout.

Borland-Grannis Company, Chicago, Ill., exhibited two four-passenger coupes.

Broc Electric Vehicle Company, Cleveland, O., had on exhibition one four-passenger coupe and two five-passenger French model broughams.

Columbus Buggy Company, Columbus, O., exhibited a new model five-passenger brougham and two four-passenger coupes.

Flanders Manufacturing Company, Pontiac, Mich., had on exhibition a four-passenger Colonial type brougham.

Hupp Corporation, Detroit, Mich., had on exhibition two four-passenger Colonial coupes.

Ohio Electric Car Company, Toledo, O., had on exhibition two four-passenger broughams, one three-passenger coupe, one Victoria coupe and a stripped chassis showing the transmission.

Rauch & Lang Carriage Company, Cleveland, O., exhibited a new "club roadster" similar to the high-speed gasoline cars in design, a five-passen- roadster" similar to the high-speed hams and a stripped chassis.

Woods Motor Vehicle Company, Chicago, Ill., had on exhibition a new model five-passenger limousine, two four-passenger broughams, a coupe, a model coupe body and a stripped chassis.

Waverly Company, Indianapolis, Ind., exhibited a six-passenger limousine, a four-passenger brougham and a Waverly roadster.

Among the accessories the following electrical companies were represented:

American Circular Loom Company, Aldene, N. J., exhibited a complete line of "No-Lag" magnetos, spark plugs and ignition specialties.

Apple Electric Company, Dayton, O., had on exhibition a complete line of automobile dynamos, starters, and lighting fixtures.

Avery Portable Lighting Company, Milwaukee, Wis., exhibited Electrobola headlights, side lights and tail lights.

Connecticut Telephone & Electric Company, Meriden, Conn., showed its automobile magneto, the new "Plug-coil," a line of shock absorbers and spark coils, switches, locks, timers, etc.

Dean Electric Company, Elyria, O., exhibited the "Tuto" electric horn, "Dynalux" lighting equipments, generators, starting devices, etc.

Detroit Electrical Appliance Company, Detroit, Mich., exhibited lighting dynamos, a new combined lighting and ignition equipment and a new electric self starter.

Edison Storage Battery Company, Orange, N. J., exhibited unusually large cells for heavy electric trucking service. The new cells are called the "A-10" and the "A-12," with capacities of 375 and 450 ampere-hours respectively. The plates are the same as those used in the smaller Edison batteries so widely used in pleasure cars and light commercial trucks. A new "B" type cell, the "B-6," 120 ampere-hours capacity, was also shown, in addition to standard equipments of other sizes. As usual there was an exhibit board showing the interior construction of the battery. The automobile lighting sets consist of five cells of 80 ampere-hours capacity inclosed in a steel box.

Electric Storage Battery Company, Philadelphia, Pa., exhibited various types of Exide, Hycap-Exide, and Ironclad-Exide batteries adapted for electric-vehicle service. There were also shown Exide sparking batteries and the new connector puller.

General Electric Company, Schenectady, N. Y., exhibited reflectors, sockets, switches and sockets for automobile lighting, a complete line of Mazda lamps ranging in size from one to twenty candlepower; combination voltmeters and ammeters and mercury-arc rectifiers.

International Acheson Graphite Company, Niagara Falls, N. Y., showed a complete line of graphite products including "Oildag," deflocculated graphite diffused in oil; and Gredag grease. A model electric furnace was also shown.

Joseph Dixon Crucible Company, Jersey City, N. J., had on exhibition a full line of Dixon graphite products including transmission and cup greases, chain compound, etc.

Kokomo Electric Company, Kokomo, Ind., exhibited a complete assortment of ignition apparatus, including its new master vibrator coil.

National Carbon Company, Cleveland, O., had on exhibition a full line of sparking and ignition batteries.

Remy Electric Company, Anderson, Ind., exhibited magnetos and coils and electric lighting equipments.

United States Light & Heating Company, New York, N. Y., had on exhibition a complete line of National vehicle batteries, truck batteries and sparking and ignition batteries; also a full line of plates and parts. Several sections of completely assembled batteries were also shown.

Willard Storage Battery Company, Cleveland, O., exhibited two distinct types of Elba batteries, one for electric lighting and sparking, the other for electric self starting.

Generator Too Big for Tunnels.

A gigantic electric generator of great capacity, built for the Ford Motor Company's factory at Detroit, Mich., has proved too large to pass through the railroad tunnels between Ampere, N. J., and Detroit. The machine was built at the Crocker-Wheeler Company's plant at Ampere, but it was found necessary to wind the armature at Detroit. For the last ten years it has been necessary for all large manufacturers of electrical machinery to keep diagrams of all the railroad tunnels in the United States, so that the parts of the big generators would not be built too large for shipment.

This particular monster has a rating of 2,500 kilowatts at a voltage of 250. This means that it can generate a current of 10,000 amperes. It is to be driven by a direct-connected gas engine, running 85 revolutions a minute.

Central Electric Exhibit at Milwaukee.

Among the list of exhibitors at the convention of the Wisconsin Electrical Association held in Milwaukee on January 18 and 19, and reported in our last issue, the name of the Central Electric Company, Chicago, Ill., was inadvertently omitted. This company was represented among the exhibitors by C. A. Felker, A. W. Dunham and B. J. Kacin.

Latest Approved Fittings

CONDUIT BOXES.—F. H. Ward, Brooklyn, N. Y.

Cast-Iron Shallow Outlet Boxes, for use with flexible conduit or armored cable. Types A, C, E, J and S.

Approved January 2, 1912.

CONDUIT BOXES, FLOOR OUTLET.—W. R. Ostrander & Company, New York, N. Y.

"The Ostrander" Cast-Iron Floor Box, for use with rigid conduit, with brass cover plate and outlet nozzle.

Approved January 2, 1912.

CONDUIT OUTLET BUSHINGS, COUPLINGS AND FITTINGS.—The Spark Electric Company, Kansas City, Mo.

"Branchlet."

A cast-iron double elbow for use with one-half-inch rigid conduit.

Approved December 14, 1911.

CONDUIT, UNLINED.—Greenfield Conduit Manufacturing Company, Jersey City, N. J. For Sprague Electric Works of the General Electric Company, Sole Agents.

"Greenfielduct."

This conduit is galvanized both inside and outside, and has in addition a black enamel on the interior.

Approved July 17, 1911.

Switch Boxes, Appleton Electric Company.

ELECTRICALLY LIGHTED SCALES.—The Computing Scale Company, Dayton, O.

A computing scale provided with attachment plug, cut-out, switch and two tubular incandescent lamps which illuminate the display sign and drum of the scale when material is placed in the pan.

Approved January 2, 1912.

FIXTURES.—T. D. Hill Company, Philadelphia, Pa.

Adjustable stem for fixtures.

Approved January 2, 1912.

HEATERS, ELECTRIC.—Geyser Electric Company, Hartford, Conn.

25 amperes, 250 volts.

Instantaneous water heater consisting of a bare-wire coil located in a series of passages in a cylindrical body of porcelain through which the water circulates when the outlet faucet is opened. The faucet handle is arranged to operate a special switch immediately after and just before the water is turned "on or off."

In this device the resistance wire, being in contact with the water, will permit a leakage of current to ground to an amount dependent upon the resistance of the water between the wire and the metal casing of the water chamber. With water of ordinary purity this leakage will be negligible.

The amount of current used by this heater makes it necessary to connect it permanently or by means of proper approved fittings to a circuit of suitable capacity. It should never be connected to ordinary lighting circuits, nor to ordinary lamp sockets or receptacles.

In the event of a failure of the water supply while the heater is turned "on" the casing rapidly attains a high temperature sufficient to ignite combustible material, but the probabilities of obtaining this condition in service is considered remote, and with normal operation this heater provides a relatively safe and ready means of heating water.

Approved January 2, 1912.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examinations and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

INSULATING JOINTS.—The Gier & Dail Manufacturing Company, Lansing, Mich.

"Lansing" Straight Electric Insulating Joints.

Approved December 27, 1911.

INSULATING MATERIALS.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

"M" Material.

An inorganic, molded, insulating, non-combustible compound of moderate dielectric and mechanical strength, somewhat brittle, unaffected by oils and slightly absorptive of moisture. It can be molded with accuray without warping or shrinkage and is suitable for use in electrical fittings requiring a material having the above properties.

Note.—Manufacturers of such devices desiring to use this material should submit samples in commercial form for examination and test.

Approved January 2, 1912.

RECEPTACLES, STANDARD.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" Brass Shell Wall Sockets, for use with "Lutz" metal molding.

Key, Catalog Nos. 4526, 4528, 7526 and 7528.

Keyless, Catalog Nos. 7527 and 7529.

Pull, Catalog Nos. 4527 and 4529.

Also connecting block for two-way bases, Catalog No. 405.

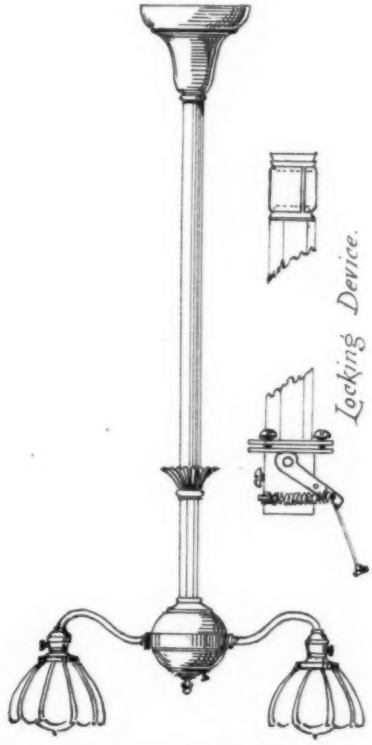
Also all the above types with shade-holders attached, key type with composition or insulated metal key.

Approved January 2, 1912.

SWITCHES, AUTOMATIC.—George W. Free, 3446 Lindell Ave., St. Louis, Mo.

10 amperes, 125 volts.

An automatic time switch, consisting of an alarm clock and an approved snap switch, mounted in a steel cabinet.



Adjustable Stem for Lighting Fixture, T. D. Hill Company.

Approved January 2, 1912.

SWITCH BOXES, COVERS FOR.—Appleton Electric Company, Chicago, Ill.

Pressed-steel covers forming face plates for push-button switches.

Single and two gang in sherardized or black-enamel finish.

Approved January 2, 1912.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

KENOSHA, WIS.—Kenosha is said to be planning for a city lighting plant.

ELK POINT, S. D.—P. W. Elis and others have been granted an electric light franchise.

ALTOONA, IOWA.—George T. Gibson has been granted an electric light franchise here.

HITCHCOCK, S. D.—Hitchcock has the installation of an electric light plant under consideration.

AVOCA, N. Y.—The Wayne Power Company has been granted a franchise for a power plant in Avoca.

SPRINGFIELD, O.—The Lighting Committee is considering the installation of a municipal light plant.

DALLAS, TEX.—The Texas Electric Company has been incorporated with a capital stock of $100,000.

MEXICO, MO.—The Mexico Power Company has been incorporated with a capital stock of $300,000.

CANTON, ILL.—The Canton Gas & Electric Company will expend $50,000 this year on enlarging its plant and distributing system.

WINTERS, TEX.—The Winters Light & Milling Company has been incorporated with a capital stock of $10,000.

WEST POINT, VA.—The People's Light, Heat & Power Corporation will improve its plant and install new equipment.

CHARLES CITY, IOWA.—The Hart-Parr Traction Company's power house which was burned will be rebuilt. C.

WELLSVILLE, O.—The town of Wellsville is considering the installation of a municipal electric lighting plant.

LA PLATA, MO.—The La Plata Ice, Heat & Power Company has been incorporated with a capital stock of $25,000.

KERKHOVEN, MINN.—H. O. Rustad and others will raise money for the erection of a new electric light system. C.

HILLSBORO, KANS.—This city is about to issue bonds in the sum of $10,000 for constructing an electric light plant.

BAKERSFIELD, CAL.—The Southern Sierras Power Company plans the extension of its line from Randsburg to Barstow. A.

PLYMOUTH, CAL.—The Empire & Pacific Mines plan the erection of a new electric power plant. J. F. Parks is interested. A.

DALLAS, TEX.—A plan is under way by the Chamber of Commerce for extending the system of ornamental lighting in Dallas.

GRAND RAPIDS, MICH.—The City Council has under consideration the matter of boulevard lighting for the downtown streets.

PASADENA, CAL.—An electrolier lighting system will be installed on South Orange Grove Avenue at an estimated cost of $30,000.

GARRETSON, S. D.—The Council is considering the matter of installing an electric light plant, the estimated cost of which is $6,000. C.

MITCHELLSVILLE, IOWA.—George T. Gibson was granted a franchise to build and maintain an electric light and power plant.

MORNING SUN, IOWA.—P. A. Yohe has been granted a franchise to install and maintain an electric light, power and heating plant. C.

GRAND PRAIRIE, TEX.—The Grand Prairie Electric Light & Ice Company has been incorporated with a capital stock of $10,000.

MEMPHIS, TENN.—Plans are under way for an ornamental cluster light system for Madison Avenue. It is proposed to install about 80 lamps.

STEVENSON, WASH.—The Northwestern Electric Company has been granted a franchise by the City Council to construct an electric power line. A.

ELYRIA, O.—The Cleveland Southwestern & Columbus Traction Line expects to spend $100,000 on new equipment for the power house south of this city.

MOUNT WOLF, PA.—The Mount Wolf Electric Light Company has been incorporated by Harrison B. Waltman, Charles A. Greenwalt and James J. Gerry.

KENNEDY, TEX.—The City Commissioners have been authorized to place some 20 50-candlepower lamps on various principal blocks in the business district.

SANTA MONICA, CAL.—The Edison Electric Company will make extensive improvements to its system here. The work is estimated to cost $30,000. A.

VANCOUVER, B. C.—The British Columbia Railway Company will double the size of its production plant. The work is estimated to cost about $4,000,000. A.

MANSON, IOWA.—The Manson electric light and power plant has been sold to Omer Healy, Corpus Christi, Tex., who will make numerous improvements to the plant.

WINNIPEG, MAN.—R. H. Smith, secretary-treasurer, will receive bids until February 8, 5 p. m., for two motor generator sets and two rotary transformers and generators. C.

GRASS VALLEY, CAL.—The cities of Grass Valley and Nevada City plan for the joint ownership of an electric lighting plant to supply both cities with electric light and power. A.

COTULLA, TEX.—The Cotulla Ice & Power Company has been formed here with a capital of $7,000. The incorporators are W. G. Roloff, Richard Wolfsky and Yale Hicks. D.

DARIEN, CONN.—The Town Selectmen have been authorized by a unanimous vote to enter into a contract with the Stamford Gas & Electric Company for 25 electric street lamps.

LYNN, IND.—The town trustees announce that they are in the market for material, equipment and expert labor to build and equip an electric light plant to furnish lights and power for the city. S.

BROWNSVILLE, ORE.—The Oregon Power Company plans to extend its lines on Walnut Avenue and Main Street. It is understood that other improvements and extensions will be made to its system. A.

HUTCHINSON, KANS.—The United Water, Gas & Electric Company, which now furnishes electric lights and power for three different municipalities, will soon make some further extensions of its electric transmission lines.

WAPPINGERS FALLS, N. Y.—The Garner Print Works has been granted a franchise by the Town Board to erect pole lines and lay conduits to furnish electric light and power to the town, as well as to New Hamburgh and Houghsonville.

NEWCASTLE, IND.—A contract to improve the city lighting plant and water plant has been let to Charles Brossman, of Indianapolis. The improvements call for the installation of new pumps, electrical machinery and apparatus. S.

FAIRVIEW, ILL.—The electric light plant here has been purchased by the Farmington Light & Power Company, Farmington. The new owners will extend their transmission line from Rapatee to Fairview and the plant here will be dismantled. Z.

PORTERSVILLE, CAL.—E. Newman, it is understood, will construct a power transmission line from Deep Creek to Los Angeles, Cal. This will be the most extensive power transmission line on the coast. The estimated cost is $2,000,000. A.

PITTSBURGH, PA.—Mayor Graves has appointed a committee of four to meet with the Chamber of Commerce and work out a plan for the new system of street lighting. The plan is to erect eight or ten ornamental poles in each block on Broadway.

KNOWLTON, WIS.—The Battle Island Company, recently incorporated with capital stock of $100,000, will build a dam near here on the Wisconsin River, and proposes to erect a hydroelectric plant which will develop a minimum of 2,300 horsepower.

RENFREW, (ONTARIO), CANADA.—The town of Renfrew has a

plan under way to construct an electric power plant with steam auxiliary. It is the intention to light the town by electricity and sell power to manufacturers.

NEVADA CITY, CAL.—This city has decided to establish a municipal lighting system.

CATHLAMET, WASH.—J. D. Haycock has been granted an electric light franchise in this city.

PORT TOWNSEND, WASH.—The Olympia Power Company has been granted permission to transmit electric current in the city limits.

STEVENSON, WASH.—The Northwestern Electric Power Company has been granted a franchise to erect electric power lines along the county roads.

MODESTO, CAL.—The Sierra & San Francisco Power Company has been granted permission to maintain a transmission line in certain parts of Stanislaus County.

VERNDALE, MINN.—The electric light plant was recently destroyed by fire at a loss of about $6,000. F. M. Hicks, the owner, will rebuild the plant in the near future. C.

ALBANY, N. Y.—The Nassau Light & Power Company has been authorized to issue mortgage bonds to the par value of $158,000, the proceeds to be applied for extensions and improvements to the plant and property of the company.

BALTIMORE, MD.—As a result of a meeting of the Art Commission held recently a committee consisting of Josias Pennington, J. E. Sperry and William E. Emmart has been appointed to have in charge the proposed ornamental system of lighting streets in the business section.

LYNN, MASS.—Some of the merchants of Lynn, headed by Elmer E. Bray and Ralp S. Bauer, are planning to have Lynn one of the best lighted cities in the country. It is proposed to use lights of the arc type, but much more powerful and brilliant than those at present in use in this city.

MILLBURY, MASS.—The power plant of the Worcester Consolidated Street Railway Company will be enlarged to such an extent that it will be able to provide power for all the lines to be controlled by the New York, New Haven & Hartford Railroad in Central and Western Massachusetts.

DEMING, NEW MEX.—The Deming Land & Power Company has been formed at Silver City, N. M., with a capital of $250,000 for the purpose of installing a large central electric power station, the construction of an extensive system of transmission lines and the installation of a number of irrigating pumping plants. The incorporators are W. D. Murray, E. A. Layne, M. F. Downs and T. L. Lowe.

ELKHART, IND.—Cyrus E. Frye, of the Elkhart Bristol Board & Paper Company, is said to be contemplating the erection of an electric power plant, to cost $10,000, at the mouth of Christiana Creek. A cement-block building is planned with one generator with a capacity of from 125 to 200 horsepower. A transmission line will be necessary.

MONTGOMERY, ALA.—For the purpose of constructing, operating and maintaining an electric power plant, the Central Alabama Power Company filed articles of incorporation with Judge of Probate, J. B. Gaston. The firm is capitalized at $10,000; $2,500 of which is paid in. The incorporators are Julius A. Horne, of Milledgeville, Ga.; W. H. Taylor, Montgomery, Ala.; S. E. Patton, Macon, Ga.; H. Horne, Macon, Ga. Z.

CHATTANOOGA, TENN.—A syndicate is being formed by Nashville residents to secure contract with the Chattanooga-Tennessee River Power Company for the output of current, at least up to 50,000 horsepower, part of the current to be taken by the N. C. & St. L. road for use in operating electric engines over the mountain at Cowan; part to be sold at Huntsville and the remainder to be used by the Warner electric interests at Nashville. The Nashville syndicate proposes to supply right of way for the transmission lines from Guild to Nashville.

ANDERSON, IND.—For the purpose of separating the lighting business from the interurban business the officials of the Indiana Union Traction Company have incorporated the Traction Light & Power Company, with a capital of $10,000. The declared purpose is to purchase current, and distribute and sell the same to towns and cities and to the public in general for lighting, heating and power purposes. Some transmission lines will be built to towns desiring current, but not on the traction company's route. The incorporators are Calvin H. Allen, William H. Forse, Jr., James A. Vanasdoll, H. A. Nicholl and A. W. Brady.

SAN ANTONIO, TEX.—The San Antonio Gas & Electric Company has increased its capital stock from $984,000 to $1,160,000. Its affiliated corporation, the San Antonio Traction Company, has increased its capital stock from $1,000,000 to $1,210,000. It is announced that the purpose of these increases is to provide means for installing a large amount of new equipment and making extensive improvements, and that during the present year more than $300,000 will be expended by the two companies for these purposes. The San Antonio Traction Company will relay portions of its track and will make important extensions to its system. The San Antonio Gas & Electric Company, which operates the local gas and electric plants and distributing systems, will lay new mains in several different quarters of the city and extend the pole lines of the electric lighting system. D.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

AURELIA, IOWA.—The telephone exchange was burned. It will be rebuilt. C.

WINNIPEG, MAN.—The city will lay a submarine telephone cable across the Red River. C.

COLFAX, WIS.—The Colfax telephone exchange which was recently destroyed by fire will be rebuilt.

HENNING, MINN.—The Henning Star Telephone Company has been incorporated with a capital of $3,500.

HURON, S. D.—The Great Western Telephone Company has been incorporated with a capital stock of $80,000.

KRATKA, MINN.—A local telephone company has been formed and will install a system in the spring.

SANGER, CAL.—The town of Sanger will soon advertise for bids on a 25-year franchise for a telephone system.

OLYMPIA, WASH.—The Postal Telegraph Company is planning to rebuild its line between Olympia and Tenino.

LOOKEBA, OKLA.—The Lookeba & Binger Telephone Company has been incorporated by J. S. Sensintaffer and others.

WINONA, MINN.—The council has granted the Tri-State Telephone Company permission to enter the city with its toll lines. C.

ERIE, PA.—The Bell Telephone Company announces an appropriation of $59,000 for a subscribers' and toll plant at Erie.

GRAND JUNCTION, COLO.—A 20-year franchise has been granted to the Mountain States Telephone & Telegraph Company.

PLAINVIEW, TEX.—The Southwest Texas Telephone Company is about to make various improvements to cost about $35,000.

OKABENA, MINN.—The Okabena Telephone Company, has decided to build a new line and put all the town phones on one line. C.

CLINTON, MICH.—The Clinton County Telephone Company has increased its capital stock from $20,000 to $50,000 and will branch out greatly at once.

St. JOHNS, ORE.—The Mount Hood Railway & Power Company is making arrangements to install its own telephone systems in its plants and offices.

BOISE, IDA.—The Mountain States Telephone & Telegraph Company plans for extensions and improvements to its local system during 1912 to cost about $300,000. A.

YESO, N. M.—J. M. Casaus, Santa Rosa, N. M., has been granted a franchise for the construction of a telephone line from Puerto de Luna to Yeso, via Elvira. D.

GOLDENDALE, WASH.—The Lyle Telephone Company has been granted permission to operate a telephone line along the public highways tributary to Lyle.

RED BLUFF, CAL.—The Tehama County Telephone Company plans to extend its lines further into the country districts and to continue work on the long distance connections.

DRESDEN, TENN.—It is reported that the Cumberland Telephone & Telegraph Company will erect new wires and poles.

SAVANNA, ILL.—The Savanna Mutual Telephone Company has been incorporated with a capital stock of $15,500. The incorporators are L. H. Maloney, J. D. Lynness and C. C. Thill.

NASHILLE, TENN.—The Rutherford Home Telephone Company has been incorporated with a capital stock of $2,000. The incorporators are R. M. Halford, M. Peel, W. R. Canada and J. L. Brown.

MORTON, WASH.—The Highland Valley Telephone Company has been granted a franchise by the City Council to build a telephone line from Morton to Riffe. E. C. Coombs is president of the company. A.

MONTEREY, MEX.—Juan Farias and Manuel Guajardo of this city have been granted a concession for the installation of a new telephone system here. They are organizing a company to carry out the work. D.

SEATTLE, WASH.—The Kent & Renton Telephone & Telegraph Company has been incorporated with a capital stock of $20,000. E. E. Webster, H. D. Campbell and G. F. Anderson are the incorporators.

FESSENDEN, N. D.—The petition of the Hamburg & Norway Telephone Company for permission to build one mile of telephone line on the south side of Section 33, Township, 150, Range 69 has been granted. C.

CHEHALIS, WASH.—The newly organized Highland Valley Telephone Company has been granted permission to string wires along the county road from Morton to Riffe. E. C. Coombs is president of this company.

NASHVILLE, TENN.—The James County Telephone Company has been incorporated with a capital stock of $2,000. The incorporators are O. G. Hughes, Hunter Furches, F. G. Tallant, W. J. Newton and G. R. Lewis.

NASHVILLE, TENN.—The Gibson County Telephone Company has been incorporated with a capital stock of $5,000. The incorporators are J. J. Tatem, W. F. Jones, R. R. Boone, R. R. Collins, W. W. Howse and several others.

HUSUM, WASH.—The White Salmon Valley Telephone Company has merged their properties under the name of the Husum Telephone Company. The new company will soon build a line from Trout Lake to Underwood, Wash. A.

FORT WORTH, TEX.—District Commercial Manager Brickhouse, of the Southwestern Telegraph & Telephone Company, has announced the intended extension of telephone service to Seminary Hill and other parts of the south suburbs. Z.

COTTAGEILLE, W. VA.—The Cottageville, Baden & Point Pleasant Telephone Company has been incorporated with a capital stock of $5,000. The incorporators are S. L. Barber, W. E. Evans, W. L. Beckwith, William Lloyd and F. J. Barber, all of Cottageville.

DEMING, N. M.—The Luna County Telephone Association has filed articles of incorporation with $25,000 capital stock. The incorporators are Hugh Ramsey, F. A. L. Taylor, and A. L. Taylor, all of Deming. The company will operate lines between towns, cities and villages in Luna County.

BRENHAM, TEX.—The Sandy Hill Telephone Company, which has its principal offices here, will make improvements and extensions during the present year. Following are the officers of the company: Henry Dierking, president; Henry Bohne, vice-president; Carl Goessler, secretary; William Ellerman, treasurer. D.

MURFREESBORO, N. C.—The United Telephone Company has been granted a charter. The authorized captal stock is $25,000. The following are the incorporators: V. Vaughan, D. C. Barnes, B. B. Winborne, L. J. Lawrence, J. E. Vance, W. P. Taylor, J. T. Williams and others. The company will build a telephone system in Murfreesboro.

ELECTRIC RAILWAYS.

(Special Correspondence.)

ROCKVILLE, IND.—An interurban road is being projected from this city to Danville, Ill. The plan is to connect it with the McKinley Traction System of Illinois. S.

TEXARKANA, TEX.—The Texarkana Gas & Electric Company will extend its street-railway line from Rose Hill to Westmoreland Place, a distance of about two miles. D.

PASADENA, CAL.—The request of the Southern Pacific Railway Company to electrify the system from the Southern Pacific depot along Broadway to the city limits will be granted.

GRAND JUNCTION, CAL.—The construction of an interurban line across the Grand River to the Redlands, and thence a distance of seven miles to the National Monument Park, is now an assured fact.

SAN ANGELO, TEX.—The San Angelo Power & Street Railway Company has been incorporated with a capital stock of $100,000. The incorporators are C. C. Kirkpatrick, W. T. Bartholomew and J. D. Sugg. Z.

WENATCHEE, WASH.—The Wenatchee Valley Railway & Power Company has sold $1,000,000 bonds, which assures the construction of an interurban from Malaga through Wenatchee to Leavenworth, a distance of 60 miles.

EVANSVILLE, IND.—The Evansville & Southern Indiana Traction Company has decided to rebuild the Howell line and equip it with new copper overhead wire. The company has also decided to purchase six pay-as-you-enter cars. S.

RICHFIELD, N. Y.—It is proposed to run a trolley line from Richfield Springs to Fort Plain via Warren or Little Lakes. The proposed road will be in connection with the road running east of Mohawk, meeting it at Montgomery's.

CLEVELAND, TENN.—A company, backed by J. W. Adams, the man who promoted the Eastern Tennessee Power Company; and the Union Development Company, is being formed for the purpose of building an interurban railway between Cleveland and Chattanooga.

BUTTE, MONT.—The Butte, Anaconda & Pacific Railway is to be electrified for 27 miles, at a cost of about $1,000,000. The power will be generated from the plant of the Great Falls-Water Power Townsite Company. There will be 17 electric motors required to operate the trains. C.

TOLEDO, O.—The Toledo Railways & Light Company will expend nearly half a million dollars in improving its power plant and equipment during the next year. The company will at once install a number of new boilers and other machinery at its Water Street power plant. A new unit will also be added. H.

STOCKTON, CAL.—The Tidewater and Southern Railroad has been granted a franchise to operate an electric road over Pilgrim Street, from South Street to Scotas Avenue and along Scotas Avenue to East Street. It provides for double tracks and the use of T-rails. The road must be in operation within two years.

GREENSBURG, PA.—The West Penn Traction Company has announced the purchase of numerous electric companies in Washington, Beaver and Allegheny Counties. The company has outlined a vast campaign in spreading out which will mean the expenditure of millions of dollars. Surveys have already been made for a trunk line from Greensburg to Latrobe, via Jamison Mines.

AUSTIN, TEX.—Amendments to the charters of the San Antonio Gas & Electric Company and of the San Antonio Traction Company, increasing the capital stock of each in substantial sums, were filed in the Department of State. The increases were necessitated by the fact that these corporations in 1911 expended $300,000 for construction and expect this year to outlay somewhat in excess of that sum. Z.

BEAVER, OKLA.—The Beaver, Meade & Englewood Railroad Company proposes to construct a line from Beaver to Meade and Englewood, Kansas, a distance of 80 miles, to cost $10,397 a mile. The company is capitalized at $25,000 and is incorporated by Fred C. Tracy, John W. Webb, William T. Quinn, Elbert Clift, Robert McFarland, Levi S. Munsell and Frank Laughrin, all of Beaver. Z.

MANNINGTON, W. VA.—The Mannington, Wadestown & Blacksville Railroad Company has been incorporated with a capital stock of $50,000, with principal offices located in Mannington. The incorporators are S. B. Harker and S. Clark Steel, Wana; Samuel Eakin and M. J. Garrison, Wadestown, and E. C. Martin, Mannington. The company will build a street car line from Mannington to Blacksville.

EL PASO, TEX.—The Stone & Webster Engineering Corporation, of Boston, Mass., is actively promoting the construction of an interurban electric railway from El Paso through the valley of the Rio Grande. The line will probably extend beyond Ysleta, which is 18 miles from here. W. E. Anderson is construction engineer of the project. The proposed line will connect here with the system of the El Paso Electric Railway Company. D.

FITCHBURG, MASS.—This section of Worcester County is involved in tentative plans for the outlay of $2,500,000 in street railway extensions, improvements and development of power facilities of the Worcester Consolidated Street Railway Company. Important among the plans is the proposed extension of Tatnuck line in Worcester through Paxton, Rutland, Colebrook and Barre to Petersham, such an extension to cost in the neighborhood of $1,000,000.

PANAMA CITY, PANAMA.—The firm of C. G. Young, engineers-contractors, 60 Wall Street, New York City, has been engaged as consulting engineer to design and supervise the construction of the system of electrical tramways to be installed in Panama City, Panama, with extensions in the Canal Zone. Mr. Young made this examination and report last year, upon the basis of which the tramways are to be built. The work is being put in hand at once and contract has already been given out for the local construction work. The system will comprise about 10.5 miles of tracks and about 15 motor cars.

FINANCIAL NOTES.

Conditions in the New York stock market at the close of the week ending January 27 gave opportunity for considerable declines in several directions following the bear raid on St. Paul securities. Heavy selling also of the Western and North Western railroad stocks resulted in a pretty general weakening all along the line.

At the annual meeting of the Columbus Railway & Light Company, three new directors were elected: Charles E. Wilcox, R. S. Warner, and William K. Lanman.

At the annual meeting of the Brooklyn Rapid Transit Company, retiring directors were re-elected.

Cyrus Adams, Jr., succeeds M. B. Starring as director of Chicago & Oak Park Elevated. Chicago Railways officials succeed three other retiring directors, Hackney, Robinson and Terrill.

J. P. Morgan & Company have purchased $20,000,000 Pacific Gas & Electric Company of California general and refunding mortgage five per cent bonds. N. W. Halsey & Company, and Harris, Forbes & Company have purchased the entire issue from J. P. Morgan & Company, and will shortly make a public offering.

At the annual meeting of the stockholders of the Standard Underground Cable Company the retiring directors were unanimously re-elected. President Joseph W. Marsh stated that at the beginning of the present fiscal year the business on the books of the company was slightly in excess of the total reported at the beginning of the previous year. He also stated that the new Canadian plant of the company is now under roof and that it is expected to be ready for operation by May 1. A total of 30,000 of the 35,000 shares of stock outstanding were represented at the meeting, mostly by proxy, though there was a fairly large number of stockholders present in person.

At a special meeting of the stockholders of the Electric Bond & Share Company it was voted to increase the authorized capital stock of the company to $10,000,000, of which $5,000,000 is to be preferred and $5,000,000 common. At present there is $2,000,000 preferred and $2,000,000 common authorized outstanding. It was also voted to alter the certificate of incorporation, to provide that the preferred stock shall be entitled to cumulative dividents at six per cent per annum. The present rate is five per cent. It was further provided that the amount of surplus which the company is required to have upon the payment of any proposed dividend on the common shall, after the payment of dividends, be equal to at least eighteen per cent of the par value of the then outstanding preferred stock.

Theo. P. Harding, in a circular on American Telephone Company collateral trust, 4s, gives a list of the securities deposited with the Old Colony Trust Company, trustee, as follows: The four per cent collateral trust bonds outstanding are $78,000,000; the four per cent convertible bonds (originally $150,000,000) are being rapidly converted into stock and there are now outstanding $20,250,000; the capital stock of the company now outstanding is $313,000,000; at present market price the capital stock is selling at $440,000,000. The four per cent collateral trust bonds are a legal investment for Massachusetts Savings Banks to the extent of two per cent of their deposits. Their total deposits at present are about $803,000,000. The total holdings of bonds by the banks at present are about $8,300,000, held by 162 banks out of a total of 192.

Dividends.

Cambridge Electric Light Company; a quarterly dividend of two and one-half per cent, payable February 1.

Electric Bond & Share Company; increased the quarterly dividend on the preferred stock one-quarter per cent by the declaration of a disbursement of one and one-half per cent. The regular rate of two per cent was declared on the common stock.

Pacific Power & Light Company; a quarterly dividend of one and three-quarters per cent, payable February 1.

Philadelphia Company; a semi-annual preferred dividend of two and one-half per cent, payable March 1.

Twin City Rapid Transit Company; a quarterly Common dividend of one and one-half per cent, and a preferred dividend of one and three-quarters per cent, both payable April 1; the former to stock of record March 11, and the latter to stock of record March 15.

Western Telephone & Telegraph Company; semi-annual preferred dividend of two and one-half per cent, payable February 1.

Reports of Earnings.

MONTREAL STREET RAILWAY.

The report of the Montreal Street Railway Company, for the month of December and three months ended December 31, 1911, compares as follows:

	1911.	1910.
December gross	$ 430,939	$ 377,274
Expenses	268,329	235,209
December net	162,610	142,065
Charges and taxes	42,061	37,642
December surplus	120,549	104,423
Three months gross	1,293,808	1,130,000
Expenses	761,106	668,401
Three months net	532,701	461,659
Charges and taxes	113,076	101,653
Three months surplus	419,625	360,006

WASHINGTON RAILWAY & ELECTRIC.

The Washington (D. C.) Railway & Electric Company, reports for the year ended December 31, 1911, compared as follows:

	1911.	1910.
Gross earnings	$4,352,671	$4,123,560
Expenses and taxes	2,410,204	2,362,610
Net	1,942,467	1,760,950
Other income	.....	23,311
Total income	1,942,467	1,784,261
Fixed charges	1,091,559	1,069,618
Surplus	850,908	714,643
Preferred dividends	425,000	425,000
Surplus	*425,908	289,643
Common dividends	130,000	130,000
Surplus	295,908	159,643

*Equal to 6.56 per cent on $6,500,000 common stock, as compared with 4.46 per cent earned on same stock in previous year.

DETROIT EDISON COMPANY.

The consolidated income account of the Detroit Edison Company, as reported to the New York Stock Exchange for twelve months ending November 30, 1911, follows:

Gross earnings from operation	$3,549,477
Expenses and taxes	2,041,597
Net earnings	1,507,879
Interest charges	677,064
Net income for year	*830,814
Dividends	414,330
Surplus	416,484
Discount on bonds, depreciation, etc.	334,786
Surplus	81,698
mon stock.	
Surplus at November 30, 1910	693,662
Profit and loss surplus, Nov. 30, 1911	775,360

*Equal to 13.8 per cent on $6,000,000 capital stock as compared with 12.3 per cent earned on $5,747,000 capital stock for year ended December 31, 1910.

KEYSTONE TELEPHONE OF PHILADELPHIA.

The report of the Keystone Telephone Company of Philadelphia, for the month of December and six months ended December 31, 1911, compares as follows:

	1911.	1910.
December gross	$ 98,875	$ 96,851
December net	49,357	49,412
Surplus after charges	24,212	24,893
Six months gross	585,701	572,479
Six months net	288,257	287,396
Surplus after charges	138,751	140,327

CAPITAL TRACTION.

The Capital Traction Company, (Washington, D. C.) reports for the year ended December 31, 1911, compared as follows:

	1911.	1910.
Gross	$2,256,640	$2,226,150
Expenses	1,127,485	1,101,989
Net	1,129,155	1,124,161
Other income	10,173	14,518
Total income	1,139,328	1,138,679
Charges, taxes and renewals	349,050	318,081
Surplus	*790,278	820,598
Dividends	720,000	720,000
Surplus	70,278	100,598

*Equal to 6.59 per cent on $12,000,000 capital stock, as compared with 6.84 per cent earned on same stock previous year.

NASHVILLE RAILWAY & LIGHT.

The Nashville Railway & Light Company reports for the year ended December 31, 1911, compared as follows:

	1911.	1910.
Gross earnings	$1,963,783	$1,832,464
Expenses and taxes	1,125,335	1,030,026
Net earnings	838,448	802,438
Interest, etc.	404,582	402,426
Balance	433,866	400,012
Depreciation, etc.	58,981	54,860
Net income	374,884	345,151
Preferred dividends	125,000	125,000
Surplus	*249,884	220,151

*Equal to 6.24 per cent on $4,000,000 com-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Jan. 29.	Jan. 22.
Allis-Chalmers common (New York)	1	1
Allis-Chalmers preferred (New York)	8	6⅛
American Tel. & Tel. (New York)	139¾	141½
General Electric (New York)	157¾	159½
Kings County Electric (New York)	129	129
Postal Telegraph and Cables common (New York)	76	77½
Postal Telegraph and Cables preferred (New York)	69½	70½
Western Union (New York)	82	84¾
Westinghouse common (New York)	71	73¼
Westinghouse preferred (New York)	118	118
Edison Electric Illuminating (Boston) (ex-dividend)	299	294
Massachusetts Electric common (Boston)	22	22¼
Massachusetts Electric preferred (Boston)	96	95¼
New England Telephone (Boston)	161	160
Electric Company of America (Philadelphia)	12	12
Electric Storage Battery common (Philadelphia)	55¼	53¾
Electric Storage Battery preferred (Philadelphia)	55¼	53¾
Philadelphia Electric (Philadelphia)	18¼	17⅝
Chicago Telephone (Chicago)	141	140
Commonwealth Edison (Chicago)	139	138
National Carbon common (Chicago)	106	106
National Carbon preferred (Chicago)	117½	118

PERSONAL MENTION.

A. S. LANGSDORF has been elected president of the Engineers' Club of St. Louis.

M. M. BISHOP, Litchfield, Ill., has been appointed acting secretary for the United Gas & Electric Company in that city.

C. H. HUBBELL, inspector of transportation of the Chicago, Rock Island & Pacific Railroad, has been appointed superintendent of telegraph to succeed the late J. G. Jennings.

GEORGE J. HENRY, JR., San Francisco, Cal., has resigned his position as chief engineer with the Pelton Water Wheel Company, and has opened an engineering office in the Rialto Building.

HARRY E. WATSON has recently been appointed sales manager, in the central district, for the Benjamin Electric Manufacturing Company of Chicago. Mr. Watson has been connected with this company for a number of years and his acquaintance among the electrical trade is extensive.

C. W. HOBSON, representing the electrical interests of Dallas, Tex., is a member of the arrangement committee for the grand exposition of Dallas's products and manufactures which will be staged in the Coliseum at the State Fair grounds in connection with the State convention of the Retail Merchants' Association, May 6-9.

F. DOUGLAS WATSON, late provincial superintendent for the National Telephone Company in Scotland, has been appointed general manager and secretary of the Société Anonyme Ottomane des Téléphones de Constantinople (Constantinople Telephone Company), and has left Paris to take up his duties in Constantinople.

SAMUEL KAHN, formerly manager of the Appalachian Power Company, Blue Field, W. Va., has been appointed to the operating department of H. M. Byllesby & Company, Chicago, to assist in the operation of the various companies controlled by the Byllesby organization. Mr. Kahn will visit properties and work with managers to produce increased efficiency and to improve conditions in general.

J. BRODIE SMITH, who resigned his position as vice-president and general manager of the Manchester (N. H.) Traction, Light & Power Company last November, is to be retained in his old position. Mr. Smith resigned at the time of a change of presidency of the company, to take effect on December 30, 1911. The resignation, however, was not accepted by the directors, and the new president, E. C. Foster, has been unwilling to let Mr. Smith sever his connection with the company and has prevailed upon him to remain.

F. H. TIDMAN, formerly manager of the Oklahoma Gas & Electric Company, of Oklahoma City, has been elected vice-president of that company, in which he is already a director. Mr. Tidman is also a director and officer of the El Reno Gas & Electric Company, El Reno, Okla., and the Sapulpa Electric Company. In his new position as vice-president of the Oklahoma company, Mr. Tidman will be relieved of the exacting requirements of the manager's position and at the same time to able to render the company the benefit of his ability and experience in public-utility operation.

OBITUARY.

WALTER W. JOHNSON, one of the pioneers and best-known specialists in X-ray work, died in a sanitarium in Rochester, N. Y., on January 26, aged fifty-three. He was a charter member of the Roentgen Ray Society of America.

GEORGE SCHUYLER DAVIS died in Cleveland, O., on January 24, 1912. He was well known in electric-railway circles throughout the country by reason of his connection with various electric railway publications, being at the time of his death editor of *Electric Traction Weekly*, of Chicago, Ill. Mr. Davis was born in Wellington, O., on August 28, 1875, his parents moving soon afterward to Cleveland, where all of his life, with the exception of a few years, was spent. In 1894 he entered the employ of the *Cycling Gazette*, of Cleveland, and continued with that publication in an editorial capacity until 1900. He then became associated with several of the leading automobile papers as Cleveland representative. About this time he also became regular correspondent to a number of technical publications, including the *Street Railway Journal*. He became regular editorial representative of this journal in the Middle West, continuing in that capacity until the fall of 1907, when he became financially interested in the *Electric Traction Weekly*, with which he has ever since been identified in an editorial as well as a business way. At first he was associate editor, but for the past several years, he has directed the affairs of the paper as editor. He was also vice-president and secretary of the Kenfield-Davis Publishing Company. Mr. Davis was one of the charter members of the Central Electric Railway Association. He was also an associate member of the American Electric Railway Engineering Association.

HENRY L. STORKE, one of the best known telephone men in the State of New York, died of pneumonia at his home in New York City on January 27. Mr. Storke had contracted a cold and complications arose which, owing to his advanced age, his vitality could not conquer. Mr. Storke was born in Senate, N. Y., in 1843, and after leaving school he engaged in the publishing business in Auburn, N. Y., where, in 1879, he was publisher of the *Daily Bulletin* and *Mining News*. In that year the commerical value of the telephone was recognized by him and he became assistant general manager of the telephone lines of the Western Union Telegraph Company. With Theodore N. Vail and Oscar E. Madden Mr. Storke in 1880 organized the first telephone company operating in Chili and Peru, which subsequently was sold to an English syndicate and is now one of the largest telephone systems in South America. He thereafter was active in the promotion of numerous telephone companies. He organized the Empire State Telephone Company, the Central New York Telephone Company at Utica and the National Telephone Exchange Association. In 1893 he was appointed Postmaster of Auburn, N. Y., by President Cleveland, a post he held until 1898. Mr. Storke retired from active work in 1902, but he retained executive offices with various companies. He is survived by a widow, Mrs. Mary Beatrice Smith Storke, three sons and five daughters. His demise marked the passing of a personality, highly respected and well beloved.

NEW PUBLICATIONS.

MINERAL PRODUCTS OF THE UNITED STATES. — The United States Geological Survey has issued a report showing the mineral production of the country for 1910, with comparisons of the values for each preceding year back to 1901. Copies of this table may be had upon application to the Director, Washington, D. C.

BULLETIN OF THE BUREAU OF STANDARDS.—Vol. VII, No. 4, of the Bulletin of the Bureau of Standards contains an article by F. W. Grover on "The Capacity and Phase Difference of Paraffin-Paper Condensers as Functions of Temperature and Frequency;" and one by Edgar Buckingham on "The Steam-Turbine Expansion Line on the Mollier Diagram and a Short Method of Finding the Reheating Factor."

PROPOSED MUNICIPAL PLANT FOR DULUTH.—Oscar Claussen and Charles L. Pillsbury, consulting engineers of St. Paul and Minneapolis, have furnished a complete report to the mayor and city council of the City of Duluth on the proposed municipal electric light and power plant. This is divided into two parts, the first part dealing with the discussion and installation costs, and the second part dealing with cost of operation and rates. This is a comprehensive discussion of the entire situation.

THE ILLUMINATING ENGINEER, of NewYork, has added to its title on the cover page "the Magazine of Good Lighting," the two last words being in particularly conspicuous type. This is a happy idea which should give this journal added prestige in the field which it has successfully cultivated for six years. While the *Illuminating Engineer* has steadfastly been the exponent of the gospel of good lighing, there are still many people who are ignorant of the fact that illuminating engineering is practically synonomous with good illumination.

THE ELECTRIC VEHICLE.—The Denver Gas & Electric Light Company has begun the publication of a monthly entitled *The Electric Vehicle*, the first issue being dated January, 1912. The issue consists of 16 pages and cover, is well gotten up and well printed. It contains considerable interesting information on electric vehicles, including an illustration of the trucks used by the company, with figures showing the expense. This publication should do much to increase the use of electric vehicles in Denver, where they are already quite popular.

STREET LIGHTING.—Bulletin No. 51 of the Engineering Experiment Station of the University of Illinois, by J. M. Bryant and H. G. Hoke, is on "Street Lighting." This bulletin is designed to supply needed information on the subject of efficient and economical street lighting by electricity. Starting with the characteristics of modern arc and series incandescent lamps, the principles of illumination are explained. These principles are then applied to the illumination of the street, curves and tables being given to show the amount of light distribution at various distances from the lamps. The comparative economy of the several arc and incandescent systems for different costs of power and lighting schedules is shown.

With the Electrical Manufacturers

The Ohio Brass Company, Mansfield, Ohio, published an interesting article on "Ceramics of High-Tension Porcelain" in its latest issue of the O-B Bulletin.

The Garwood Electric Company, manufacturer of C & C dynamos, motors and appliances, has moved its Philadelphia office to Room 613, Betz Building. The business transacted from that office has been exceptionally good during January.

The Dielectric Manufacturing Company, of St. Louis, Mo., manufacturer of insulating materials and electrical fixtures, will erect a one-story factory at 3853 Duncan Avenue. The company's headquarters are now at 224 South Vandeventer Avenue.

Joseph T. Ryerson & Son, of Chicago, manufacturers of machine tools, structural and rolled steel, have established a district office in the Ford Building, Detroit, Mich. R. J. Stayman and J. H. Marlotte have charge of this branch.

The Hess-Bright Manufacturing Company, Philadelphia, Pa., has issued a new price list of H B-DWF ball bearings of the most common sizes. These bearings have come into very extensive use for automobile and other severe service.

The Dale Company, Thirteenth and Hudson Streets, New York, N. Y., manufactures a very complete line of both electric and gas fixtures, and its latest types are attracting much attention. The company is placing a low-priced fixture on the market, full information respecting which will be furnished upon request.

The Sprague Electric Works of the General Electrical Company, 529 West Thirty-fourth Street, New York City, has ready for those interested Bulletin 239, which gives an illustrated description of its full automatic push-button control systems for the operation of printing presses.

The National Conduit & Cable Co., 41 Park Row, New York, N. Y., has added a large brass foundry to its various manufacturing departments. This is under special laboratory supervision and is adapted for making high-class brass and similar alloyed castings of all kinds.

The General Electric Company, Schenectady, N. Y., is distributing Bulletin 4903 dealing with switchboard panels for small plants. These range from 1 kilowatt at 125 volts to 200 kilowatts at 250 volts. They are made of dull black marine slate and are low priced, though provided with high-grade equipment.

The Condit Electrical Manufacturing Manufacturing Company, of Boston, Mass., has ready for distribution advance price lists of the extension line of Condit circuit-breakers both for oil break and carbon break, also its new catalog No. 125 dealing with Shawmut fuses, fuse blocks, ground connection clamps, cable clips and other electrical fittings.

The Rome Wire Company, Rome, N. Y., has ready for distribution its latest edition of "Copper History," which in convenient leaflet form gives the monthly average price of copper from July, 1883, to January, 1912.

The Vulcan Crucible Steel Company, Aliquippa, Pa., is distributing a pamphlet dealing with its Vulcan, Hula and Wolfram vanadium steels that are particularly adapted for automobile use.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has secured an order from the Pennsylvania Water & Power Company, of McCall's Ferry, Pa., for a 12,000-kilowatt 11,000-volt, three-phase, twenty-five-cycle, vertical water-wheel generator. This is one of the largest machines of this type that has ever been built.

The Reliance Electric & Engineering Company, Cleveland, O., has issued Bulletin No. 7010 describing its automatic starting control for motor-driven machinery. This equipment is being largely used on machine tools, and the bulletin contains a great deal of interesting and helpful information regarding such applications. The advantages of automatic control are fully explained and numerous illustrations given showing the application of motors with automatic starters.

The Best Manufacturing Company, Pittsburgh, Pa., has published its general catalog No. 103 for the year 1912. This is a book of some 400 pages devoted to the company's extensive line of piping equipment of all kinds for steam, air and hydraulic high-pressure piping systems in power-plant work. Special care was exercised in making the book very convenient for reference. Dimensions are given in unusually complete form. A section gives general information of value to power-plant engineers and operators.

The Chicago Fuse Manufacturing Company, 170 S. Clinton Street, Chicago, Ill., has ready for distribution some new information respecting the "Union" cabinet switch and cutouts for N. E. Code fuses. The switches are made with liberal metal allowance and rigid mechanical construction. The knife-blade jaws are perfectly formed, making a good contact through the entire surface. The switches are mounted on heavy porcelain bases with high barriers between each fuse and blade, and are packed for shipment in individual cartons. Full information respecting this line will be furnished upon request.

The Phoenix Glass Company, New York, N. Y., has published two bulletins that should be in the hands of everyone interested in electrical glassware. The bulletins describe respectively the new Reed and Ribbon and Laurel Leaf globes of Phoenix quality. These globes are distinct in appearance and are made to match a series of new metal fixtures of the same design. Full information respecting these patterns and designs will be sent to those interested upon request.

The Wagner Electric Manufacturing Company, St. Louis, Mo., announces the removal of its San Francisco office to the new Rialto Building with the store entrance at 110 New Montgomery Street. The office will continue in charge of A. J. Myers.

The Holophane Company, 16 East Fortieth Street, New York City, has prepared, through its Architectural Department, a portfolio of thirty highly artistic fixture designs that were executed by many of the leading fixture manufacturers of the country. In each of these is incorporated one of the recently developed designs of decorative Holophane glassware. This development is unique in adopting the well known scientific properties of this glassware to ultra-artistic lighting installations. Along with the richness of the designs one is impressed with the consciousness that they will produce appropriate illumination. In each case the new glassware is in complete harmony with the design of the fixture. The wealth of new Holophane designs thus made available is an important contribution to the lighting art.

The Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., in bulletin No. 13 describes and illustrates its inter-communicating telephones. This company has devoted a long period of research and great expense to the development of a perfect system of inter-communicating telephones. The modern, up-to-date business office adopts the intercommunicatory system as a necessary adjunct for the rapid transaction of business, and the Stromberg-Carlson Company has met the demand for this apparatus by building a system this is durable, simple and reliable in construction, easily operated and maintained. Bulletin No. 13 describes in detail the various parts which go to make up the intercommunicating system and the inter-relation of one element with the other. There are also a number of interesting diagrams which make it easy to decide upon a system of practically any number of extensions or connections. While this catalog is of interest particularly to the telephone engineer and man familiar with circuits, the explanatory matter is so lucidly worked out and the diagrams so carefully and cleverly arranged that the office or factory manager or superintendent can easily understand the possibilities of this system. This bulletin will be sent to those interested upon request.

PROPOSALS.

ELECTRICAL SUPPLIES.—Proposals will be received until February 13 by the Navy Department, Bureau of Supplies and Accounts, for the following material. Schedules may be obtained from the Navy Pay Office nearest each Navy Yard. In making application the schedule number should be given.

Article.	Quantity.	Delivery at Navy Yard.	Schedule.
Steel, conduit	5,000 feet	Norfolk Va.	4292
Cable, interior communication	Miscellaneous	Brooklyn, N. Y.	4296
Wire, bell	300,000 feet	do	4296
Wire, cables, armored	Miscellaneous	do	4296
Wire, cable, copper clad	200,000 feet	do	4296
Wire, cable, portable	50,000 feet	do	4295
Wire, cable, searchlight for	2,000 feet	do	4296
Wire, conductor, double	10,000	do	4295
Wire, conductor, double	1,000	do	4296
Wire, conductor, double, flexible	5,000	do	4295
Wire, conductor, double	50,000	do	4296
Wire, conductor, double, silk	50,000	do	4296
Wire, conductor, double	50,000	do	4296
Wire, conductor, single	Miscellaneous	do	4296
Wire, conductor, single	do	do	4296
Wire, conductor, single	2,200 feet	do	4295
Wire, conductor, single, weatherproof	1,000 feet	do	4295
Wire, conductor, triple, silk	5,000 feet	do	4296
Wire, conductor, twin	Miscellaneous	do	4296
Wire, copper	8,000 feet	do	4295
Wire, duplex, rubber insulated	Miscellaneous	do	4295
Wire, duplex, rubber insulated	do	do	4295
Wire, electric light	1,000 feet	Lake Demark, N. J.	4293
Wire, rubber insulated	Miscellaneous	Brooklyn, N. Y.	4295
Wire, telephone cord	75,000 feet	do	4296
Wire, twin, rubber covered	1,500 feet	do	4295
Hangers, conduit	1,000	do	4304
Hangers, insulator	3,700	do	4304
Tachometers, hand portable	12	do	4304
Furnishing electric freight elevator	1	do	4330

Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until February 15 for furnishing electrical equipment, as per Canal Circular 675; until February 20 for furnishing transformers, as per Canal Circular 678.

POST OFFICE AT VIRGINIA, MINN.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until 3 p. m., March 4, for the construction complete (including plumbing, gas piping, heating apparatus, electric conduits and wiring, and interior lighting fixtures) of a building, for the Post Office at Virginia, Minn. Drawings and specifications may be obtained from the custodian of the site at Virginia, or at the office of the Supervising Architect.

NEW INCORPORATIONS.

TOPEKA, KAS.—The Kansas Electric Sales Company has been incorporated with a capital stock of $250,000.

MEDFORD, ORE.—The California-Oregon Power Company has been incorporated with a capital stock of $10,000,000.

LOS ANGELES, CAL.—The Wade-Gough Electric Company has been incorporated by K. L. Wade, P. G. Gough, and E. E. Kelly, with a capital stock of $10,000. A.

KANSAS CITY, MO.—The Moss-Satterlee Electrical and Railway Supplies Company has been incorporated with a capital stock of $5,000. The incorporators are William B. Satterlee, Benton C. Moss and Jay Richardson. Z.

BUFFALO, N. Y.—Frederick Truscott & Son Company has been incorporated with a capital stock of $50,000. Frederick Truscott, Bessie S. Truscott and George S. Truscott are the incorporators. The company will engage in an electrical supply business.

NEW YORK, N. Y.—The United Secret Service Company has been incorporated with a capital stock of $500. Bertha Schlansky, Max Angenblick and Max Ginsberg, all of New York City, are the incorporators. The company will install electric burglar alarms.

DALLAS, TEX.—The Texas Electric Company has been incorporated with a capital stock of $100,000. The purpose of this organization is to act as financial and fiscal agents, the promotion and construction of street and suburban railways, electric light and power plants and other industrial enterprises.

NEW YORK, N. Y.—The Electro-Sanitation Company has been incorporated with a capital stock of $100,000. The incorporators are C. F. Frothingham, John C. Sparks and R. O. Butterfield, all of New York City. The purpose of the company is to carry on a business of electric sewage purification.

DATES AHEAD.

National Independent Telephone Association. Annual convention, Chicago, Ill., February 7-9.

Wisconsin State Telephone Association. Annual meeting, Madison, Wis., February 14-15.

National Electrical Supply Jobbers' Association. Hollenden Hotel, Cleveland, O., February 13-15.

New England Section of the National Electric Light Association. Annual meeting, Hotel Kimball, Springfield, Mass., March 21-22.

Northwestern Electric Show. Minneapolis, Minn., March 16-23.

National Railway Appliances Association, Inc., Chicago, Ill., March 18-23.

American Railway Engineering and Maintenance of Way Association. Chicago, Ill., March 19-21.

Minnesota Electrical Association. Minneapolis, Minn., March 20-22.

National Electric Light Association. Annual convention, Seattle, Wash., June 10-14.

American Institute of Electrical Engineers. Annual convention, Boston, Mass., June 25-28.

National Electrical Contractors Association. Annual meeting, Denver Colo., July 17-20.

The 1912 Boston Electric Show. Mechanics Building, Boston, Mass., September 28-October 26.

Record of Electrical Patents.

Issued by the United States Patent Office, January 23, 1912.

1,015,280. Telephone Toll Apparatus. E. P. Baird, assignor to Baird Manufacturing Co., Chicago, Ill. Relates to the control of the coin box of a telephone pay station.

1,015,283. Automatic Motor Controller. T. D. Beintema and D. De Rooi, Oskaloosa, Ia. Includes a number of intermeshing ratchet wheels, the complete rotation of the last of which releases a control lever that opens the ignition circuit of the engine and cuts off its fuel supply.

1,015,300. Automatic Lock Switch. W. R. Cox, Cleveland, O. The key of a multi-tumbler lock operates a rotary snap switch.

1,015,317. Dry Cell. F. J. Humel, assignor to National Carbon Co., Cleveland, O. Has a central perforated carbon electrode to which are secured several porous disks extending through the battery mix toward the zinc cup.

1,015,328. Magneto-Circuit Controller. E. S. Lincoln, Brookline, Mass., assignor to Electric Goods Manufacturing Co. A timing device and circuit-interrupter for a magneto ignition system.

1,015,352. Electric Switch Attachment for Vacuum Cleaning Devices. J. Slevin, New York, N. Y. An electrically operated curry-comb for horses and cattle. Has projecting from its applicator a rounded spring blade that closes the power circuit when it is brought into contact with the animal's body, removing the scurf.

1,015,414. Telephone Repeating System. C. Adams-Randall, assignor to Randall Telephone Manufacturing Co., Augusta, Me. A telephone repeater including independent controllers for governing the sending and receiving circuits.

1,015,439. Smelting Furnace With Electric Refining Hearths Connected Thereto. A. Helfenstein, Vienna, Austria-Hungary. A cupola furnace has two opposite lateral extensions near its base that connect with electric refining chambers.

1,015,442. Circuit-Interrupter. C. J. Hixson, East Orange, N. J. Includes a magnetic blow-out coil surrounded by a cooling chamber.

1,015,484. Electric Conductor Distribution. F. W. Erickson, New York, N. Y. A support for conduit consists of thin sheet metal forming a trough with the outer edges bent over to form angle supports and clips to grip the conduit.

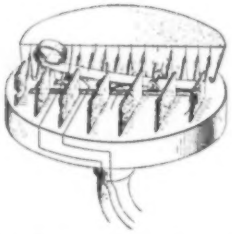
1,015,492. Electric Welding Machine. J. A. Heany, Flint, Mich. The casing contains a step-down transformer to whose secondary the electrodes are connected.

1,015,494. Electric Transmission of Intelligence. I. Kitsee, Philadelphia, Pa. Means for neutralizing the inductive effect of cable circuits include an anti-inductive device for each circuit with one coil in the line and the other in the common return.

1,015,515. Photometer Attachment. C. H. Sharp, White Plains, and P. S. Millar, New York, N. Y. Has an inclosure with a single electric lamp-introducing opening therein, a number of lamp supports, and means to move the lamp supports successively into the opening.

1,015,534. Alternating-Current Motor. A. C. Bell, Westfield, N. J. A single-phase motor has a short-circuiting plate which is brought against the commutator by weighted elbow levers when the speed attains a certain value.

1,015,546. Electrolytic Cell. W. H. Davis, assignor of one-half to G. W. Teal, Boulder, Colo. Has a rotary shaft, and a number of permeable electrodes mounted thereon, transversely to the flow of the electrolyte.



1,015,352.—Switch for Vacuum-Cleaning Curry-Comb.

1,015,613. Electric Switch. G. A. Burnham, assignor to S. B. Condit, Jr., Boston, Mass. An oil switch in which the main and auxiliary movable contacts are carried by a cross-head.

1,015,623. Magneto. S. L. Kelly, South Bend, Ind. Has a casing formed of sections with semicylindrical extensions at each end and caps to hold the sections together.

1,015,644. Selector for Automatic Telephone Exchanges. B. Settegast, assignor to Deutsche Telephonwerke Gesellschaft, Berlin, Germany. Includes a lifting magnet for raising a toothed bar that connects a pair of disks, also means for turning the disks and making contact with the lower one.

1,015,681. Photographic-Printing Machine. W. C. Huebner, assignor of one-half to G. Bleistein, Buffalo, N. Y. Includes an electrically controlled light chamber and an electric clutch for adjusting the sensitized plate.

1,015,715. Signaling Device. C. A. Schindler, West Hoboken, N. J. A flat incandescent lamp is mounted on the back of a glove th t has a contact switch between two of its fingers.

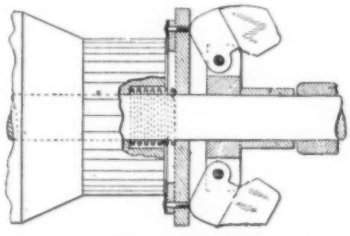
1,015,720. Process of and Apparatus for Making Calcium Cyanamide from Calcium Carbide. F. S. Washburn, Nashville, Tenn. Consists in feeding carbide in thin layers into an atmosphere of nitrogen and subjecting the layers as formed to electrically controlled heat.

1,015,721. Lamp for Matching Colors by Artificial Light. M. Weertz, Bradford, England. About an incandescent lamp is a conical reflector having a light filter for its base that consists of a royal-blue glass superposed on a nickel-green glass.

1,015,728. Lifting Magnet. A. C. Eastwood, Cleveland, O. Has vents from the winding space containing a heat-softened insulating material to exclude moisture.

1,015,730. Means for Testing Fabric. J. R. Gill, London, Eng. The fabric is moved under a magnifier and is illuminated from above and below by electric lamps.

1,015,734 & 1,015,735. Primary Battery. R. V. Heuser, assignor to Roessler & Hasslacher Chemical Co., Perth Amboy, N. J. Has a rod of sodium in a copper tube containing mercury. In the second patent there is provided a filling of copper oxide separated from a compressed layer of sodium amalgam.



1,015,534.—Short-Circuiting Disk for Single-Phase Motor.

1,015,748. Electric Clock. A. Tuerk, Chicago, Ill. An electromagnet periodically operates a ratchet disk and through this winds the clock.

Reissue.

13,365. Method of and Mechanism for Producing Musical Sounds. G. Breed, assignor to Lyrachord Co., New York, N. Y. Original No. 1,007,265, dated Oct. 31, 1911. The strings are vibrated by an electromagnet controlled by a current pulsator.

Patents That Have Expired.

Following is a list of electrical patents issued by the United States Patent Office) that expired January 29, 1912:

533,078. Primary Battery. Richard O'Toole, Mechanicstown, Md.

533,083. System of and Apparatus for Controlling Electric Circuits. William B. Potter, Lynn, Mass.

533,084. Rectifying-Commutator and Method of Making Same. Henry G. Reist, Schenectady, N. Y.

533,100. Electric Arc Lamp. Hans O. Swoboda, New York, N. Y.

533,107. Electrical Measuring Instrument. Edward Weston, Newark, N. J.

533,108. Electric Motor. Charles Wirt, Chicago, Ill.

533,130. Combined Curb, Gutter, and Conduit for Electrical Conductors. William Kingsley, St. Paul, Minn.

533,142. Telephone System. John I. Sabin, and William Hampton, San Francisco, Cal.

533,146. Apparatus for Smoothing Currents of Dynamo-Electric Machines. Charles E. Scribner, Chicago, Ill.

533,147. Telephone-Switchboard Apparatus. Charles E. Scribner, Chicago, Ill.

533,148. Spring-Jack for Telephnoe-Switchboards. Charles E. Scribner, Chicago, Ill.

533,154. Circuit-Closer for Railway Rails. Edgar C. Wiley, Bristol, Tenn.

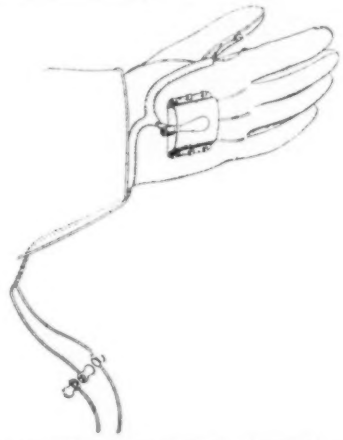
533,183. Automatic Electrical Signal. Henry C. Storrs, Hartford, Conn.

533,196. Combined Portable Stand and Wall-Bracket for Incandescent Electric Lamps. Herman Horn, Philadelphia, Pa.

533,211. Electric Arc Lamp. Eugen Conrady, Keighley, England.

533,223. Incandescent Electric Lamp. George R. Lean, Cleveland, Ohio.

533,244. System of Distribution by Alternating Currents. Charles P. Steinmetz, Schenectady, N. Y.



1,015,715.—Signal Lamp Mounted on Glove.

533,245. System of Electrical Distribution. Charles P. Steinmetz, Schenectady, N. Y.

533,246. Winding for Dynamo-Electric Machines. Charles P. Steinmetz, Schenectady, N. Y.

533,247 and 533,248. System of Electrical Distribution. Charles P. Steinmetz, Schenectady, N. Y.

533,249 and 533,250. Monocyclic Motor. Charles P. Steinmetz, Schenectady, N. Y.

533,254. Signaling Telegraph. Frank A. Turner, Chelsea, Mass.

533,259. Electric Locomotive. A. Lloyd Wiegand, Philadelphia, Pa.

533,261. Bonding Device for Electric Railways. John J. Zimmele and Antoine Bournonville, Philadelphia, Pa.

533,269. Recording Ampere-Meter. William H. Bristol, Hoboken, N. J.

533,270. Electrical Measuring Instrument. Wiliam H. Bristol, Hoboken, N. J.

533,318. Controller or Switch for Electric Motors. William J. Pohlman, Woodbrook, Md.

533,323. System for and Method of Electrical Distribution of Energy. William Stanley, Pittsfield, Mass.

533,378 and 533,379. System of Electrical Distribution. Charles P. Steinmetz, Schenectady, N. Y.

533,398. Automatic Electric Safety System for Railroads. Rene R. Snowden and Albert C. Ives, Ocalca, Fla.